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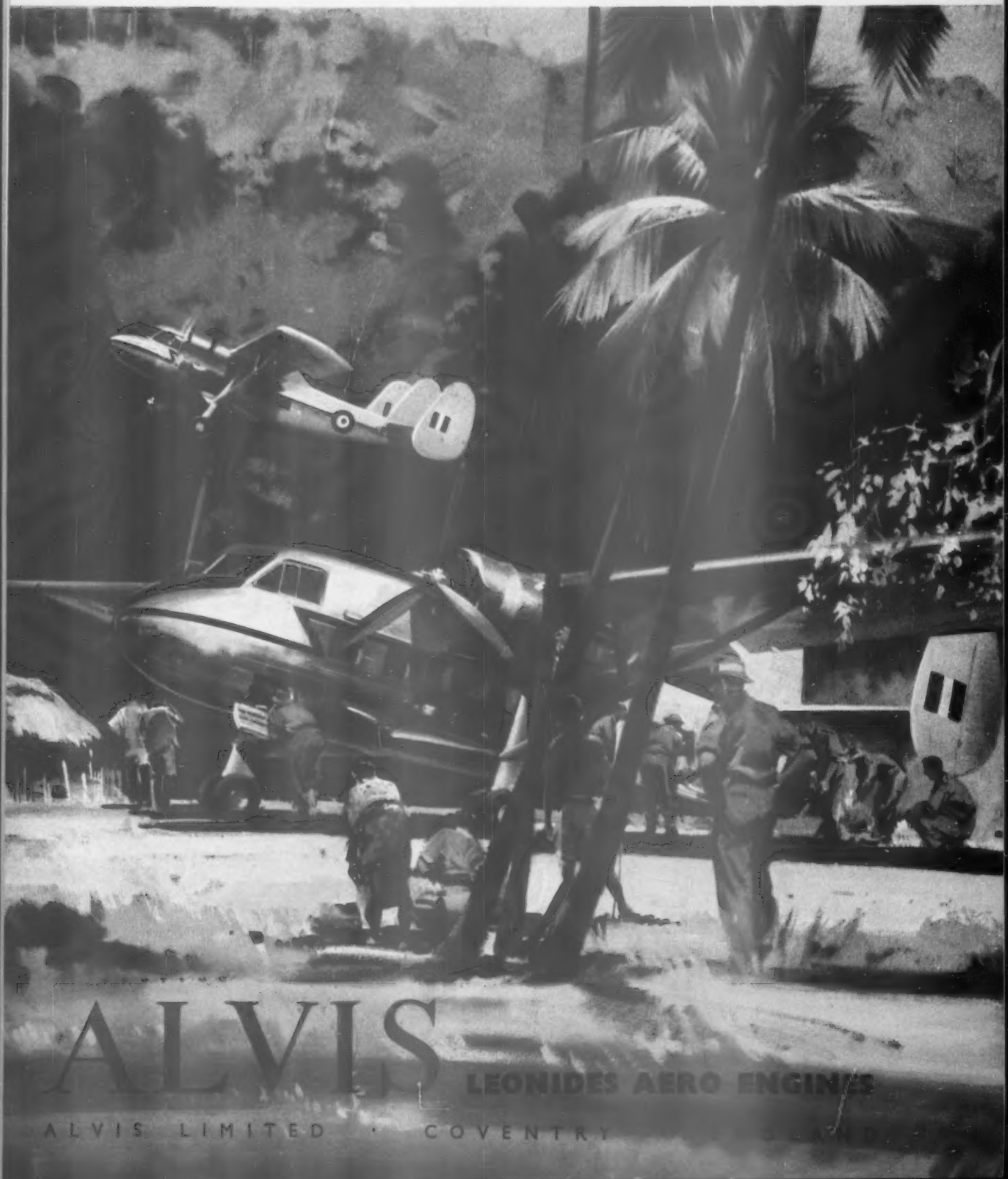
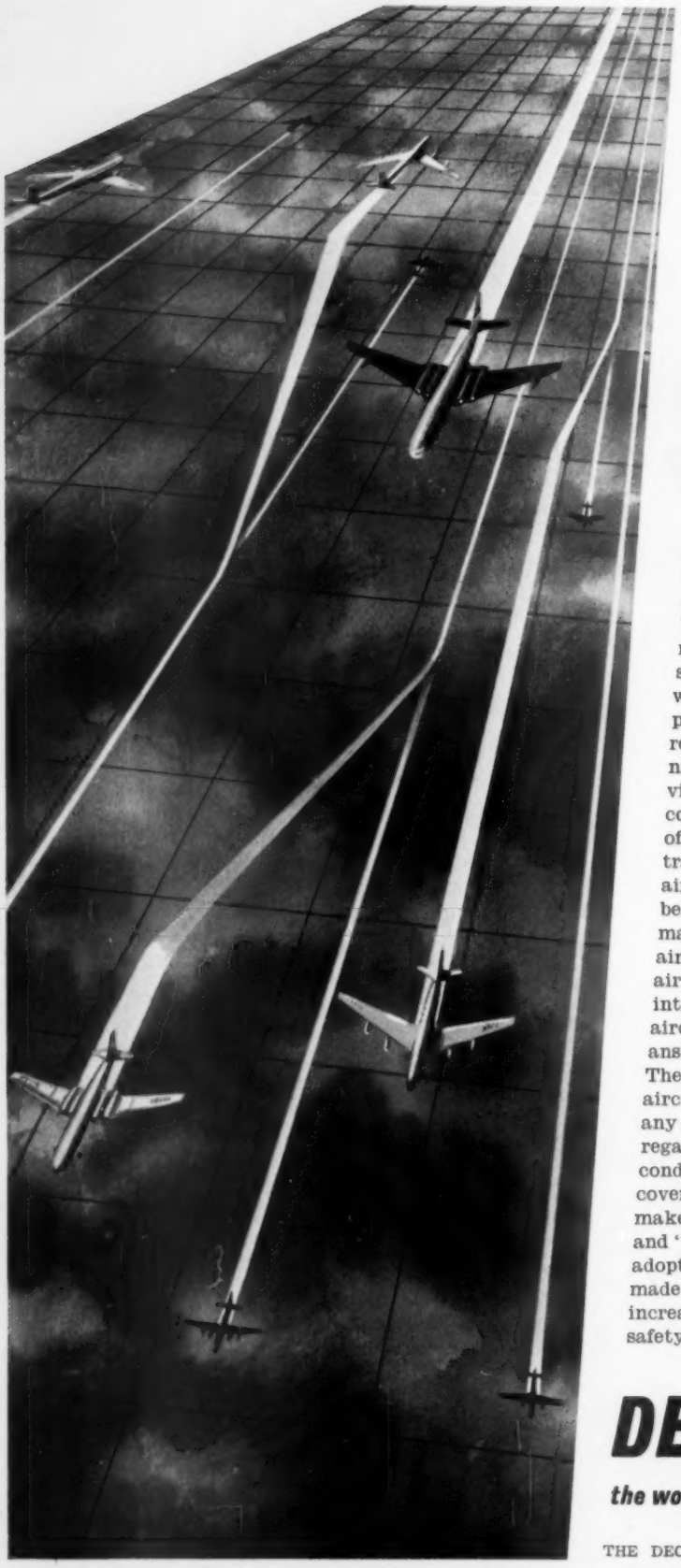
THE AEROPLANE

MARCH 6, 1959

EVERY FRIDAY
ONE SHILLING
AND SIXPENCE





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From the dawn of aviation nothing fundamentally new has been added to the earliest principles of air traffic control. Until now these were founded on the requirements and limitations of relatively slow aircraft for which altitude separation was practical. Aircraft speeds and performance have since improved beyond recognition, but the basic system of navigation and air traffic control has remained virtually unchanged. Single tracks and common points of intersection are only two of the severe restrictions imposed on air traffic, threatening its very existence. The air, intrinsically a free medium, is swiftly becoming overcrowded and safety can only be maintained at the expense of inefficient aircraft operation, delays and over complicated air traffic control . . . a condition which the introduction of turbo-prop and turbo-jet aircraft will aggravate still further. Yet the answer exists today in a fully developed form. The Decca Navigator System enables all aircraft to navigate accurately and maintain any ATC-assigned track with precision, regardless of altitude, speed or weather conditions. This very accurate hyperbolic area coverage system, with its pictorial presentation, makes the introduction of lateral separation and "passing lanes" a reality. It is only by the adoption of such a system that full use can be made of the total air space, enabling the rapidly increasing numbers of aircraft to operate with safety and economy.

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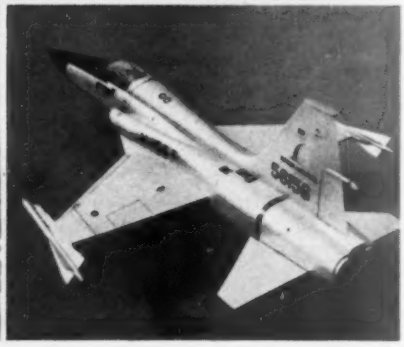

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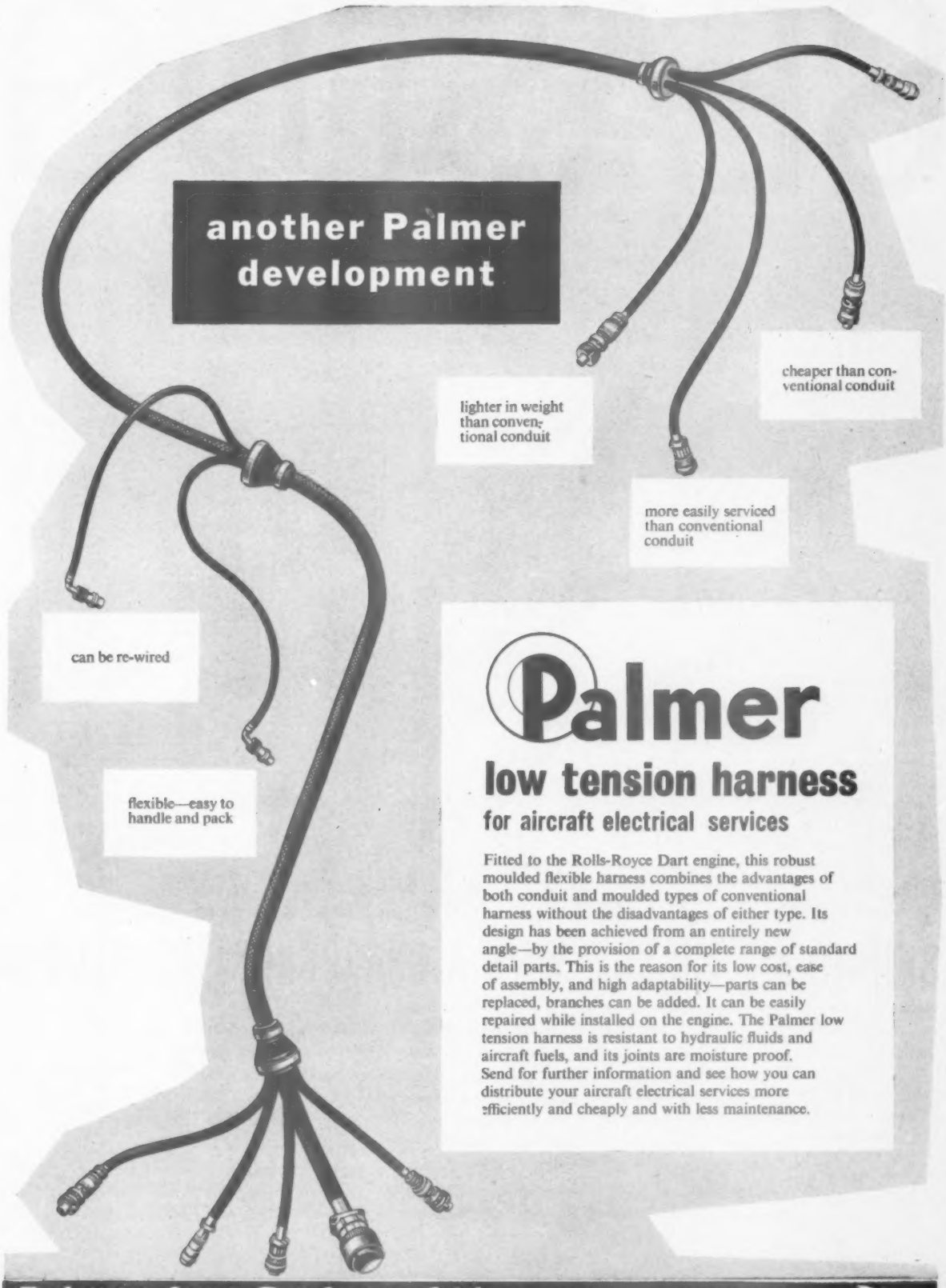
A Division of Northrop Corporation, Beverly Hills, California, U.S.A.



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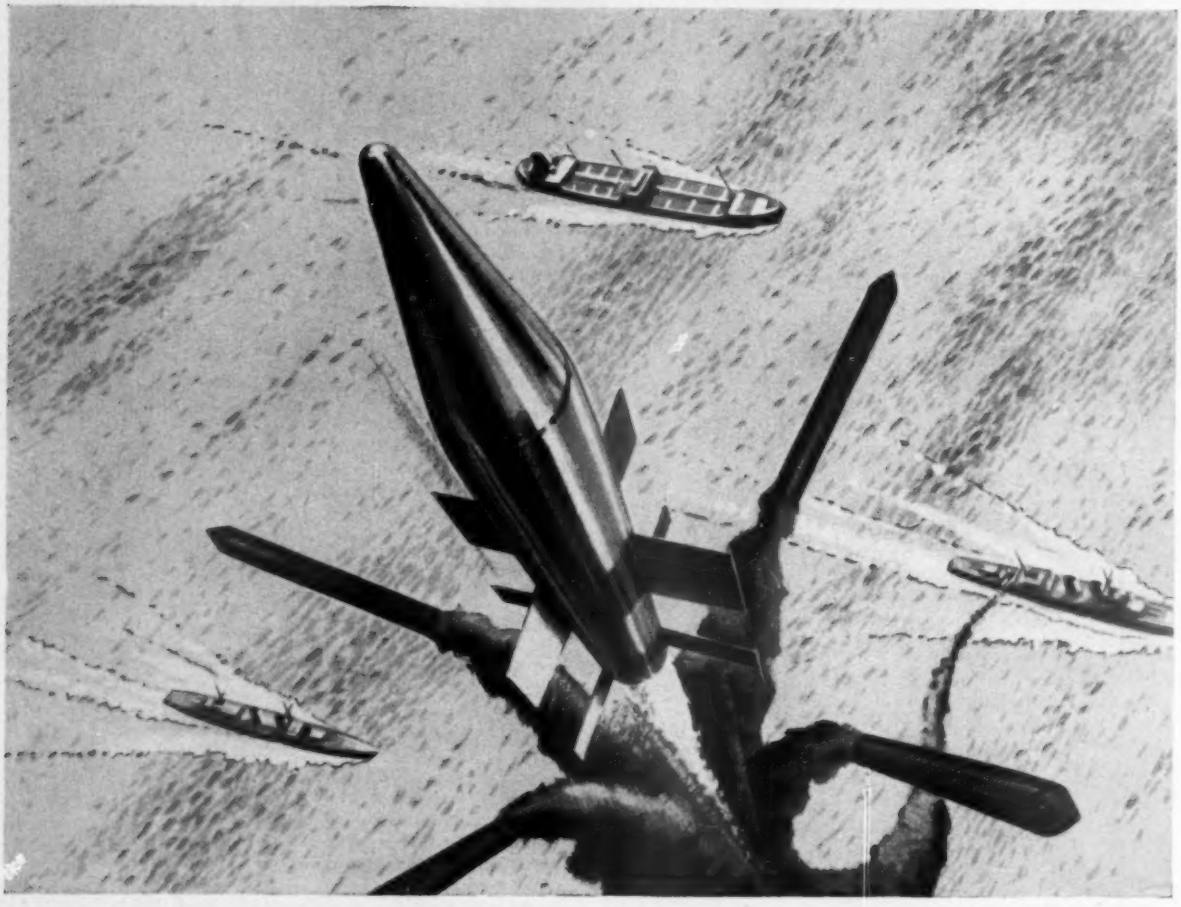
SEASLUG



SHIP-TO-AIR MISSILE WITH A SHARPSHOOTING RECORD

The Seaslug is the Royal Navy's first ship-to-air missile. Launched from the pitching, tossing deck of its trial ship, H.M.S. Girdle Ness, it has proved its accuracy under the most trying conditions. Although the Seaslug does not need to score a hit to destroy its target, the test vehicle, without a warhead, has made direct strikes frequently on target aircraft. With long range radar, it can engage bombers up to the maximum height at which modern aircraft can fly. The firing crew is far smaller than the crew of a gun turret in a major warship.

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THE AEROPLANE

Incorporating
Aeronautical Engineering
Edited by - - THURSTAN JAMES

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Founder and First Editor (1911-1939), C. G. GREY

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MISSILES FOR EUROPEAN DEFENCE

HAVING determined by personal observation the number of hours needed to read the verbatim account of the debate on Defence in the House of Commons, which took place between the hours of 15.50 and 21.57 hrs. on February 25 and 15.45 and 22.00 hrs. on February 26, we are quite sure that most people will have to be content to take their information of what happened from the necessarily curtailed account in the daily papers. Opportunity was not unnaturally taken of the occasion to make political capital for each speaker's party out of the decision to end conscription. The question of who is to have the decision to launch strategic or tactical nuclear weapons naturally arouses very deep-seated emotions. But we have to devote our efforts to the technical aspects.

In his opening remarks, Mr. Sandys said we must do everything we can to consolidate the system of collective defensive alliances established in conformity with the United Nations Charter, namely, NATO, the Baghdad Pact and SEATO. In this context it was informative to learn that the number of men available for the Army's Strategic Reserve was estimated to be about 75,000 today; this figure is to fall later to around 70,000.

The carrying capacity of the Royal Air Force is about equal to that of British European Airways, which, so far as we have been able to establish, moves an average of 53,000 people per week. Half as much capacity again will be added when the twenty Britannias get into service, the first is expected to arrive in April; another 50% will be added when the Argosies and Britannics come into service.

However, of most technical interest in the debate was the information given, or to be inferred, about missiles. The cost of developing and manufacturing the British ballistic rocket will be roughly of the same order as that of developing and manufacturing another generation of strategic bombers. This information will surprise even those who have estimated that the cost per pound weight of a rocket is more than that of a military aeroplane. Presumably, in the case of a rocket much more of the cost is spent on testing and experimental work, not only on firing the motor but on testing the electronic gear, than is the case with an aircraft. Newcomers to aviation have never failed to be appalled at the problem of installing "modifications" in aircraft. This phenomenon has in no way lessened with the coming of missiles. "Retrospective" modification, that is the incorporation of improved components, is a missile "must" until the moment of actually preparing a missile for countdown. It has to be noted too that the cost of bomber aircraft has been astronomical since the War, so that the figures for the next generation of strategic bombers must be substantially higher than anything we have previously been given. Of Thor, the American rocket with an American warhead under American control for which we provide sites and operational troops, Mr. Sandys disclosed that we are paying £10 million towards its development.

Later in the debate, Mr. Aubrey Jones, Minister of Supply, noted that in the Thor and Jupiter, the U.S. had single-stage missiles of very limited range. Beyond these missiles there are the multi-stage missiles of much greater range. In Blue Streak we have a single-stage missile intermediate between these two ranges, which missile is what the U.S. do not have. He explained why Blue Streak offers the most practical way for us to develop a successor to Thor and Jupiter for use from European bases and to this end, Mr. Jones disclosed, we have invited European co-operation in the development of Blue Streak.

On a cognate subject he disclosed that we are working out a co-operative programme with the U.S. to devise a defence against the ballistic missile. Mr. Jones' remark that it is not too early to take counter-measures against the anti-missile missile by inserting jamming equipment in the missile, coupled with his explanation that the superior range of the liquid-fuelled rocket over the solid-fuel rocket means more payload for this purpose was taken to mean that Blue Streak is to incorporate such equipment. Indeed the position was precisely stated by Mr. Sandys when he came to wind up the debate. The missile, he said, will have to be provided with means of evading or foxing the anti-missile missile which is coming up to destroy it. These devices and decoys in the rocket may require quite a lot of space and may be fairly heavy. If, therefore, we wish our rocket to remain an effective deterrent for a reasonable time it should possess a margin of additional power and payload to accommodate these future developments. Blue Streak with its powerful thrust and large capacity will, Mr. Sandys believes, provide this margin and, sited underground, will be very difficult to knock out.

Before he finished his speech, Mr. Jones had been asked whether this country visualized a joint effort with the U.S. for defence purposes in earth-space satellite projects, particularly in developing a radar screen. Unfortunately, there was no direct answer.

Matters of Moment

Manned NASA Moon Rocket

RESEARCH WORK in the U.S. has begun on a manned Moon rocket, according to evidence given before the Senate space committee by Mr. Dale Wyatt, NASA assistant director of space flight development. He said that a manned journey to the Moon would not be possible for a good many years because of the extensive preliminary work needed. Before a landing could be made unmanned robots would be sent to selected parts of the Moon and a beacon placed in position to guide the manned vehicle to satisfactory landing terrain.

A seven-stage launching vehicle standing about 300 ft. high will be needed; it would weigh more than 2,000 tons at take-off, but the manned stage itself would weigh only 2,100 lb. Four of the stages would be fired on leaving the Earth, the fifth would decelerate the vehicle for its Moon landing, the sixth would be used for take-off from the Moon and the last stage for re-entry and landing on return to the Earth. Before a Moon landing is made a man will probably be placed in a temporary orbit around the Moon. This could be done with a vehicle only one-quarter as powerful as the seven-stage vehicle needed if a landing is to be made on the Moon's surface.

Coy Lecturers

SCIENTIFIC societies consider the spreading of knowledge to be one of their major rôles. The objects and purposes of the Royal Aeronautical Society, for example, are defined in its Charter as "the general advancement of the Aeronautical Art and more particularly for promoting that species of knowledge which distinguishes the profession of Aeronautics." Thus it comes somewhat as a shock when R.Ae.S. branches hold lectures which cannot be reported in the technical Press for the benefit of all who are interested.

Closed lectures of this type have been held recently at the R.Ae.S. Hatfield and Weybridge branches; they dealt respectively with the development of Britain's latest fighter and of a new turboprop engine. Reasons given for preventing reports of them were so that the lecture could be made "more interesting and factual," in one case; in the second commercial security was given as the reason.

These reasons make no sense; anyone willing to pay a few shillings a year can join a local R.Ae.S. branch. Only an interest in aeronautics is required; any air-minded butcher, baker or candlestick maker can join. Branch secretaries seek publicity for their lecture programmes and try to attract as many people as possible to their lectures.

Clearly these audiences are in no way security-cleared. It is ridiculous for lecturers speaking to them to expect that the information given will remain confidential. They might just as well speak from a Hyde Park soap-box. Why, then, should reports of these lectures not be published?

This trend towards secret lectures is the more to be regretted because a section of the R.Ae.S. has taken enlightened steps in the opposite direction. Until recently technical information on guided missiles was cloaked under a heavy security screen. But things have changed following the formation of the R.Ae.S. Guided Flight Section—now named the Astronautics and Guided Flight Section. Its excellent programme of lectures on missiles and related topics has lifted the unnecessary screen of secrecy on these subjects and its talks have attracted audiences which on average are larger by far than for other R.Ae.S. lectures. Its lectures in the field of missiles and astronautics have been widely reported and have obviously enhanced R.Ae.S. prestige.

Against this background it is surprising that some lecturers to R.Ae.S. branches should wish their talks to go unreported. A principle is at stake—that there should be no ban on reports of security-cleared lectures. Attempts to impose such a ban are against the interests of the aeronautical community as a whole.

A Specialist Service

AN important component of the English Electric Group's aviation interests which has been growing steadily during the past five years, is their Aircraft Equipment Division at Bradford. Specializing in electrical equipment and systems this has come to be one of the Group's major sections and represents a £2 million investment. It is hoped that this effort will lead to the development of British electrical equipment—particularly for the next generation of British civil aircraft—which will more than stand its own in competition with equivalent American products. At Bradford the English Electric Aircraft Equipment Division has laboratory facilities said to be the most modern of their kind in Europe and worth £½ million.

In London last week, Lord Caldecote, deputy managing director of English Electric Aviation, Ltd., and a director of the parent Group, gave a progress report on the Division's activities and had something to say about their future plans. No fewer than 17 military and civil aircraft now make use of E.E. equipment. These include the Mk. 2 Victor and Vulcan, the Canberra, Lightning, Jet Provost, Bristol 192, and Javelin, with complete generating systems; and the Comet 4, Scimitar, Britannia, Canadair CL.44, NA.39, Gannet, Dart Herald, and Firefly, with various components. Several British guided weapons also use English Electric equipment.

This summer, the Bradford laboratories are planning to run a complete aircraft electrical system intended for the civil market at home and overseas. This will make use of a civil version of the Sundstrand constant-speed drive (built under licence from America by English Electric) which is now in production for the Boeing 707s on order for B.O.A.C.; and the company's brushless alternator—which was the first to be designed and built in this country for aircraft use.

Both the Victor 2 and Vulcan 2 use the company's new

ORPHEUS TRIO.—Seen at Filton recently were these three fighters—all powered by Bristol Orpheus turbojets. Left to right are the Fiat G.91, the Folland Gnat, and a North American Sabre.

50 YEARS ON.—Canada celebrated the 50th anniversary of the first powered flight in the Commonwealth on February 23—by flying a replica of the aircraft over the same ground. Left, Mr. J. A. D. McCurdy, who made the historic flight in the original Silver Dart, is made Honorary Air Commodore of the R.C.A.F.; he is receiving the honour here from Air Marshal H. Campbell. Right, the replica Silver Dart flies at Baddeck, Nova Scotia, in the hands of Wg. Cdr. P. Hartman.

military constant-speed AC electrical generating system upon which the civil system is based. To date the English Electric Sundstrand drive has completed 12,000 hr. of running time including flight testing and the brushless alternator has successfully accomplished more than 1,500 hr. of development running.

So far as future work is concerned, the Division is already developing new equipment with performance characteristics that will be suitable for such aircraft as the TSR.2 and the projected supersonic airliner. Brushless generators of "advanced design" form a principal part of this development.

It is interesting to note that the Aircraft Equipment Division is not a part of English Electric Aviation, Ltd., but works as a separate component of the Group. This is a logical arrangement in view of the fact that many of the Division's customers are competitors of either the aircraft or missile section of English Electric Aviation.

Lord Caldecote emphasized that proven reliability in electrical equipment is of paramount importance to the operator—and that when proven American systems are available there is a strong temptation to use them. Even in this country preference was sometimes shown for American equipment similar to that made here, even though the British product was at least as reliable as its American equivalent and was cheaper. He was confident, though, that in time the serious competition offered by equipment from across the Atlantic could be met.

Twenty-five Years of A.O.A. Service

TWO disappointments marred the annual dinner of the Aerodrome Owners Association which followed the annual general meeting in London on February 25. The first was the absence through ill-health of the retiring chairman, Mr. Charles Newton. The second was the fact that the Minister of Transport and Civil Aviation had been unable to accept the scheme put forward by the Association for Government grants to airfields not owned by the State. "The main reason for this," said MR. JOHN HAY, who has recently taken the place of Mr. Airey Neave as a Joint Parliamentary Secretary to the Ministry of Transport and Civil Aviation, "is that the Association's scheme assumed that we were content to go on losing money indefinitely on our airport account, and although your scheme, if adopted, would have meant a smaller loss for us, I am afraid," he continued, "our objective must be to remove the loss altogether."

He had been preceded by MR. T. J. OWEN, who proposed the toast of "Civil Aviation." Earlier, AIR CDRE. WHITNEY W. STRAIGHT had proposed the toast of "The Association." In the course of this he had referred to the importance of private flying. In connection with this he expressed the view that if sufficient demand were to be forthcoming, the production of a suitable turbine power unit for light aircraft should be possible at a suitable price. The new chairman of the Association, ALDERMAN V. J. ROSS, in his reply paid tribute to the work of his predecessor, Mr. Charles Newton.

MR. W. J. TAYLOR, Parliamentary Secretary to M.o.S., in replying to the toast of "Our Guests," proposed by COLONEL R. MOULD-GRAHAM, concluded the evening with a witty speech which he began by noting that if a Yorkshireman went in first you ensured victory, if he went in last you avoided defeat.

In its annual report the Association notes that on December 31 last it completed a quarter of a century of service to the owners of non-State aerodromes in this country. It now has 42 ordinary members, 34 associate members and 38 affiliate members. Of the associate members, the annual report says they comprise Local Authorities throughout the country who are hopeful that their areas will be included in the initial network of rotor-aircraft passenger services.

Private Flying in America

THAT the Government of the U.S.A. is not averse to encouraging private flying is indicated by the vast amount permitted: figures just issued by the Aircraft Owners and Pilots Association reveal that private aircraft account for no less than 97.1% of the total aircraft registered. There are 95,577 of them, a figure many times greater than the combined totals of the rest of the World.

Of the 6,414 new private aircraft sold by the U.S. industry in 1958, the average list price of each was $21,047.70 (about £7,500). The "big three" of private aircraft manufacturers supplied 5,782 of this total; individual figures are Beech, 694 (worth $35,546,664); Cessna, 2,926 ($49,196,000) and Piper, 2,162 ($35,397,332).

An attempt to discover comparative United Kingdom production has not been successful, although one manufacturer comments that sales have been "depressingly small."

The latest issue of the Air Registration Board's *British Register of Civil Aircraft* shows a total of 1,714 registered civil aircraft. These can be broken down as, scheduled and non-scheduled airline aircraft, 561 (33%); operated by clubs, groups, training schools, and business and private aircraft, 845 (49%), and other categories, 308 (18%).

When one considers the restrictions which are suffered by private flying in the United Kingdom, it is particularly galling to us to read in the A.O.P.A.'s release that of the U.S.A.'s 7,000 civil airports, *all are used for private flying*. Only 569 are used by the airlines. At the major terminal airports, private aircraft were in 1958 responsible for 51% of the total aircraft movements, while the airlines recorded 28%.

The Ministry of Transport and Civil Aviation informs us that there are 181 civil aerodromes, plus 16 "factory" aerodromes whose use is restricted, in the U.K. Of this total only 107 may be freely used by private flyers.

£800m. Exports Since the War

THE British aircraft industry's export total for January—£13,011,002—brought the value of aviation exports since the War to £800,030,168, of which the sale of aero-engines accounted for £222,594,848, or 28%.

This January figure (which compared with last year's monthly average of £12.83 million) was the largest ever recorded for the first month of a year, the previous best—£11 million—being

attained in January, 1958. The January, 1959, figure was made up of: aircraft and parts, £7,568,140 (£6.7 million in January, 1958); aero-engines, £4,771,211 (the second highest ever achieved as against £3.9 million in January, 1958); electrical appliances, £315,459 (£246,041); tyres, £93,163 (£46,339), and aeronautical instruments £263,029 (£127,495). The 60% overall increase in the sale abroad of electrical appliances, tyres and aeronautical instruments is worth noting.

Implication of the Atcherley "Spacevicle"

SALVOS of rockets and jet effluxes of many colours marked the ultimate departure of Air Marshal Sir Richard Atcherley, K.B.E., C.B., A.F.C. and Bar, from the Headquarters of Flying Training Command on February 27. It was a fitting conclusion to the farewell dinner in the Mess at Shinfield Park to mark the retiring A.O.C.-in-C.'s 36 years of service in the Royal Air Force. The glare that attended the passing of his "spacevicle" was of such magnitude that, if we are to believe the Sunday papers, the countryside was alerted. In the opinion of those who attended the ceremony the intensity of the illumination was certainly near solar.

This light-hearted termination to the career of a great R.A.F. personality might well have coincided with the launching in the United States of the X-15. Between these apparently widely separate types of launching there is, in fact, a close link. Air Marshal Sir Richard Atcherley has been at pains to place on record in various farewell speeches his unshakeable belief that there is a long future ahead for R.A.F. pilots.

The fact that the X-15 is an advanced version of a manned aircraft and that its sponsors are confident that with its aid the U.S. will be able to put into space the man in charge at its controls, provides valuable support for his view. There are, of course, other plans afoot in the U.S. to launch a man-carrying satellite in a more conventional way with rockets.

It is generally accepted that manned satellites will be the next step in the exploration of space. It seems certain that such craft will be manned in the early stages by crews who will certainly be drawn from governmental test establishments. The logical next step would be to train Service crews for the job. Against such possibilities it may not be so very long before Flying Training Command finds itself working out space flight training routines, and these may well involve officers who are at present cadets at Cranwell.

Wren writes about Sir Richard Atcherley's Service career on p. 272.

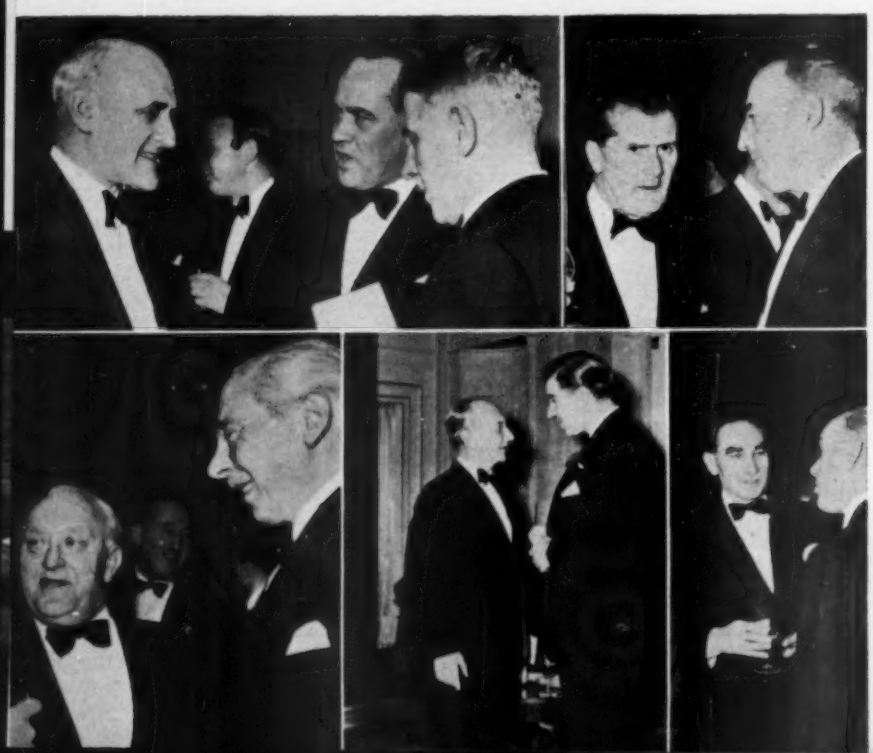
Blackburn's Half-century

BRITISH aviation is riddled these days with pedantic historians eager to point out that somebody's first flight didn't take place on a certain date and that if it did, it was a hop or a leap and not a flight. So it was with an easy mind that I attended "A Dinner to honour the 50th anniversary of the entry into aviation of Mr. Robert Blackburn, the Founder of the Company." Not much of a spark there to set our Correspondence page alight. Indeed, as the evening of February 26 wore reminiscently and pleasantly on, it became known that the late Mr. Blackburn himself modestly described his first attempts, at Filey Sands, as "sand-scratchers." But perhaps one could argue about a definition of sand-scratching.

The Blackburn and General Aircraft Company's 280 guests at the Dorchester included the leaders of every kind of British aeronautical activity and interest—"This vibrant gathering," ADMIRAL SIR CASPAR JOHN defined it. They heard speeches describing the Yorkshire pioneer as "lovable, determined, self-effacing, generous and dedicated." SIR ROY DOBSON, managing director of the Hawker Siddeley Group, spoke of his old friend, collaborator and competitor and told stories of the days "when you didn't get into aviation to make money." The first Blackburn aeroplane had its setbacks but B. C. Hucks took his ticket on No. 2, a pretty wonderful achievement all round. "Dobbie" noted that Harry Goodyear, who had worked as a ground engineer with both Blackburn and Avro in their formative years, was in the audience, and spoke also of other characters of that time, Mark Swann and Bill Gower. Robert Blackburn, he said, had built the first all-metal tubular steel aeroplane and had introduced the "daughter-firms" idea when the company, with £20,000 capital, was set up to make war machines in 1914. He described the company's progress over the years, recalled the Cobham-Blackburn airline, absorbed into Imperial Airways, and ended with reference to the two latest Blackburn types, the Beverley and the NA.39.

MR. ERIC TURNER, B.G.A. chairman, expressed to Sir Roy everybody's regret that his Canadian company had had to stop work on the Arrow and wished Sir Roy good fortune on his immediate visit to Canada. Mr. Turner spoke of his own memories of Robert Blackburn, who had told him of the hard times which had sometimes beset the old company. When, for instance, two of the firm's staff, who were sharp at cards, were detailed to join employees in the homeward-bound train on Friday nights to try to win back their pay packets. And how the workers could be sure of their next week's wages while there remained on the airfield a haystack which could be sold. He referred also to the Cirrus engine, the post-War amalgamation with the General Aircraft company, and Blackburn's long association with the Royal Navy.

This aspect was, quite naturally, the theme of the brief and brilliant speech of ADMIRAL SIR CASPAR JOHN, Vice-Chief of Naval Staff, who stood in for LORD MOUNTBATTEN, an influenza victim. He revealed that the Navy had recently celebrated, very quietly, its own fiftieth anniversary of its first association with aviation. In 1908 their Lordships had issued one of their "less happily phrased communiqués" which recorded their opinion that aviation would never have any value in naval warfare. In the ensuing years the Navy had endeavoured, not without success, to produce aircraft carriers which would match the aircraft offered by the industry. The governing bodies, which earlier in the evening had suffered at the hands of Sir Roy, were not spared by the Admiral: "M.o.S.," he said, "see that we get what we deserve, rather than what we want."—WREN.



BLACKBURN ANNIVERSARY.—Among many distinguished guests at dinner in London on February 26 to honour the entry into aviation 50 years ago of Mr. Robert Blackburn were: (Left to right, upper then lower) Vice-Admiral Sir Peter Reid (Third Sea Lord and Navy controller); L. J. Dunnett, new permanent secretary of M.T.C.A.; Air Chief Marshal Sir Claude Pelly, controller of aircraft, M.o.S.; Air Marshal Sir Geoffrey Tuttle, deputy chief of the Air Staff; Air Marshal Sir Hubert Patch, new air member for Personnel; Air Marshal Sir Andrew McKee, A.O.C.-in-C, Transport Command; (Sir Hubert Patch in background). Air Vice-Marshal H. N. Thornton, director, Blackburn and General Aircraft, Ltd.; Sir Frederick Brundrett, scientific adviser to the Ministry of Defence; Eric Turner, chairman, Blackburn and General Aircraft, Ltd.; Air Marshal Sir John Whitley, retiring air member for Personnel; Marshal of the Royal Air Force Sir William Dickson, chairman, Chiefs of Staff Committee.

The Axe and After in Canada

Toronto

IN a single day, half of Canada's 36,000-man aircraft industry has been dissolved. Within four hours of Prime Minister Diefenbaker's fateful announcement that the Avro Arrow fighter and the Orenda Iroquois engine programmes had been cancelled, the two companies discharged their 13,800 employees. About 600 sub-contractors will also be affected.*

The two firms made it clear that the men were being discharged, not laid off. However, Avro Aircraft has a U.S.A.F. development contract for a VTOL aircraft, funds for which had been stopped by the Canadian Government in December, 1954. Orenda had just received a contract from the West German Government, and presumably both companies have minor work connected with the servicing of their products.

News of the companies' action, which came three days before the celebration of the 50th anniversary of powered flight in Canada, stunned everyone in the industry. Last September, the Government cancelled the Astra I fire-control system and the Sparrow II missile programme for the Arrow. Announcing that two Bomarc missile bases would be built in Canada, the Prime Minister said that the entire Arrow programme would be reviewed, and a decision announced by March 31, 1959.

Much public discussion and many representations followed; Mr. Diefenbaker complained of lobbying. Air Marshal Slemon, deputy C.-in-C. at NORAD Headquarters, came out in favour of manned aircraft in general and the Arrow in particular. His incautious remarks and others' suggested that the Government might change its mind, or at least decide to tool up for and build the Convair F-106 for Air Defence Command or another type for the NATO Air Division in France and Germany.

Thus everyone was surprised by the timing of the announcement and the lack of an alternative programme. Mr. Diefenbaker said there was no other work that could be assigned to the companies working on the Arrow and the Iroquois. When the news came A.V.M. John Plant, president and general manager of Avro Aircraft, had just signed a union contract.

The high cost of the Arrow, its unexpectedly short range, and changing defence requirements were among the reasons given for the cancellation. When the CF-105 was first conceived in 1952, it was thought that 500 or 600 aircraft would be needed, and that the unit cost might be $1,500,000 or $2,000,000. The development of both aircraft and engine have been a success but, for various reasons, both have been much behind schedule.

The Prime Minister said that the first modern long-range bombers confronted Canada five years ago, but the numbers produced have been lower than were forecast. Thus the threat against which the Arrow could be effective has not proved to be as serious as previously expected.

Missiles the Major Threat

During 1959 and 1960 a relatively small number of modern bombers will constitute the main airborne threat. The Government considers that the present defence system of North America is adequate to meet the threat. By the middle 1960s the missile seems likely to be the major threat and the long-range bomber will be relegated to supplementing a major attack by missiles. It would be only after mid-1962 that the CF-105 Arrow could be fully operational in the R.C.A.F., he concluded.

Attempts had been made since September to sell the Arrow to the U.S.A.F., although it is difficult to understand why a project costing $300,000,000 was not integrated earlier. The U.S.A.F. decided, no doubt influenced by the powerful U.S. aircraft industry lobby, that it would not be economical to buy the Arrow, and has discontinued work on aircraft having the same general performance. Instead, the emphasis is on the chemically fuelled North American F-108. The unit cost of the Arrow makes sales of it to other nations most unlikely, apart from the fact that it is most effective when used in conjunction with the elaborate SAGE (semi-automatic ground environment) computers.

The cancellation of the special Canadian fire-control and missile systems effected a considerable economy, reducing the total average cost per unit for 100 operational aircraft from about $12,500,000 to about $7,800,000, including weapons, spare parts and the completion of development. This stunning figure (especially for a small country) does not include any of the $303,000,000 spent on design and development up until September, 1958, or the cost of additional facilities at fighter bases. At the last shareholders' meeting of A. V. Roe Canada, Ltd., President Crawford Gordon, Jr., quoted the cost of an Arrow as $3,500,000, excluding only armament.

The numerous critics of the Arrow programme had suggested that the Convair F-106 Delta Dart could have been built in Canada for half the cost of the CF-105. Both sides were surprised that the Government considered neither was necessary.

Re-equipping NATO

Many conferences have been taking place about the re-equipment of the Canadian Air Division in NATO. Although its Orenda-powered Sabres were once the most formidable fighters the West had, they have become obsolescent. As possible replacements, the Grumman F11F-1F Tiger and the Northrop N.165F were among those favoured. Either could have kept the Avro and Orenda plants busy.

The Government's decision must have been a difficult one, particularly at a time when unemployment was high. Moreover, the emigration of engineers to the United States has always been unpopular, and the Arrow cancellation could add to this flow. However, the country's large budgetary deficit and the fact that the Arrow represented such a large percentage of the defence budget were important considerations.

Emotions have already run high over the decision, for the Arrow represented Canadians' high technical ability in a dramatic, tangible way. It had already achieved Mach 2, and with the 28,000-lb. (with after-burning) Iroquois engines, the Mark 2 could probably have captured the World absolute air speed record for Canada. This would have been a noteworthy achievement for a new country of 17,000,000 people.

In spite of the companies' melodramatic discharges, all is not lost. The other contracts will have to be completed, although only small staffs will be required. A merger of Avro Aircraft and Orenda seems probable, unless substantial new work is found. Avro has talked of a supersonic airliner, but it is unlikely that it would finance such a project itself. The public outcry which has arisen, especially from those districts where Avro/Orenda workers have been buying homes, could force the Government to subsidize the project.

The Arrow decision will be unsettling for Canadair, Canada's other major aircraft manufacturer. With no new fighter going into service, the desirability of all-jet training diminishes and, with it, the market for the two-seat Canadair CL-41. This jet trainer, in the same class as the Hunting Jet Provost, has been delayed by the cancellation of the Fairchild J-83 engines.

Having just finished building 1,815 Sabres and 656 T-33s, Canadair is now working on a handful of Argus maritime-reconnaissance aircraft, CL-44 long-range four-engined transports and CL-66 transports, all for the R.C.A.F. Like Avro, the company has had little success in overseas markets. It is now vigorously promoting the CL-66 Cosmopolitan, which is a Convair 440 with Eland prop-jets, and negotiating for a factory to build them in Brazil.

Realizing its dependence on Government business, Canadair has diversified into atomic reactors, electronic mail-sorting machines and amphibious personnel carriers. However, these projects constitute a small portion of the total volume. When the Sparrow II missile was cancelled, Canadair farmed out 180 scientists and engineers to Boeing. This will put Canadair in a good position should any of the R.C.A.F. Bomarcs be built in Canada.

With the completion of Canadair's contracts, the R.C.A.F. will have modern aircraft in every category except fighters. As the Government has no intention of replacing the home-defence CF-100s, the NATO Air Division represents the only source of potential orders. Thus the future of the Canadian aircraft industry is anything but bright.

Yet another unit of the industry is faced with oblivion. The

* Since this article was written, the Canadian Government has agreed to share the wage costs of "certain technical work" with A. V. Roe Canada, Ltd., for the next six months to keep the essential nucleus of the company's design, research and technical staff intact.—ED.

Canadian Car plant at Fort William is to be moved to Montreal. Now a subsidiary of A. V. Roe Canada, CanCar built 1,451 Hurricanes and 830 Curtiss SBW Helldivers during the War, and Harvards and Beechcraft Mentors since. CanCar's Jet Mentor is under the same cloud as the Canadair jet trainer.

The picture is much brighter at de Havilland's, which has concentrated on building for the civil market. Otters and Beavers will continue in production during 1959, whereas the CS2F Tracker programme for the R.C.N. should terminate in mid-1960. Much of the last programme is subcontracted, so that the dislocation from the completion of it will be limited. About $10,000,000 has been invested in the Caribou twin-engined STOL transport. It is problematical whether the R.C.A.F. or the Canadian Army will buy it, but it should have a modest future with the U.S. Forces and with civilian operators. Twenty might be bought as "give-aways" to NATO nations.

The Full Life

AN Atcherleyless R.A.F. is almost impossible to contemplate. Indeed, when I was a pre-War Auxiliary, the Atcherley exploits made such a mark on my youthful sensibilities that I tended to think that perhaps the initials "R.A.F." stood for the "Richard Atcherley Force." Nevertheless, Air Marshal Sir Richard Ll. R. Atcherley, K.B.E., C.B., A.F.C. and Bar, retired on March 1 and a fabulous Service career has ended.

The quantity and variety of facts, stories and legends about him that I have gathered from many friendly people are such that the editor could well run a special Atcherley issue of THE AEROPLANE. It would have been a world-wide sell-out. America, Norway, Pakistan, Europe, N. Africa—all have known his exuberance, his *élan*, *brio*, what you will. This is the side of his character which so many of us know and delight in. It manifested itself mainly in his flying, 37 years of it.

At a recent function, the C.A.S. summed up Dick Atcherley's approach to his beloved aviation—"He will fly anywhere, any time—and anyhow." The "anyhow" touch, and certain manifestations during his Cranwell cadetship, led to the nick-name of "Batchy." He flew anything that offered. When I asked him to name some, he was sorry, he said, that he hadn't kept a log book for the last 20 years or so—which is somehow typical—but recalled the 504K, which he learned on, and then "Well, flying-boats, seaplanes, helicopters, the Flying Flea, CF-100, parachutes . . . and there was that airship, a Goodyear blimp, at the Chicago World Fair in, I think, 1930. I bribed the pilot to let me fly it, although he wouldn't let me land it, for some reason."

I can add Sopwith Snipe with 29 Sqn.; Supermarine S.6 in the Schneider Trophy Race, 1929, when he was disqualified out of second place for cutting a corner, but raised the 100-km. closed-circuit record speed to 332 m.p.h.; Blackburn Lincock in America; Fairey IIIF; Avian Monoplane; Spitfire (he was shot down in one in 1942, baled out into the Channel, and wounded, swam half a mile to his dinghy); Hunter, Swift, F-86, most modern types, and his personal Meteor F.8 hack, in which he made his last flight in the R.A.F. And, I suppose, about 200 other types, in his 10,000 hours of flying.

When he flew his fastest aircraft, the F-100 Super Sabre, there turned up one of those near-dicey incidents which, in Dick Atcherley's case, have so often ended amusingly—". . . jest natcherly Atcherley" as the Americans might say. From Edwards A.F.B., he'd taken off, with "Chuck" Yeager flying "chase" in a T-33. At height, he pushed the F-100, an early model, through Mach 1 but it started porpoising, a short-coming, since eliminated, which only throttling back could overcome. Dick fought it, vainly, until he heard "Chuck's" quiet voice in his headset: "Relax, general, relax."

Also in U.S.A., at the 1930 Chicago Fair, he aerobatted to such effect that alarmed spectators called on the police to stop him. There, too, he modified an aeroplane so that he could fly it astride the fuselage, dressed in hunting pink. Add to these items his King's Cup win in 1929, the fact that he was an R.A.E. test pilot for three years, and performed at Cleveland in the American National Air Races four years running, and you know that you are dealing with a fully paid-up aviator.

Furthermore, he developed, pre-War, a flight-refuelling system and at a blacksmith's near C.F.S., engineered in collaboration with the present C.A.S. a Genet Moth engine for inverted flying. A War-time invention was the Drem lighting system.

Turning to his quick wit, you may remember his signal to Air Marshal "Paddy" Bandon when that lively Earl went through a fence at the end of the Bovingdon runway: "Congratulations on being the first to take a Vampire through the barrier." Then there is one of the best-known stories of all, which records that when an airman passed him with a "Good morning, sir," he called him back and told him: "What I want from you, my lad, is a salute, not a weather report."

This story serves to point up an aspect of Dick Atcherley which is largely submerged by his "Batchy" reputation. He was a disciplinarian where it did most good, and indeed, is on record for his assertion: "Spit and polish are closely associated with flying efficiency." This sense of proper discipline, with his superb airmanship, wit, energy and serious purpose, made him a natural leader.

As well as commanding squadrons, stations, and fighter bases, he developed night fighter tactics at No. 54 O.T.U., Drem; commanded No. 211 Gp. Desert Air Force, and later at H.Q. Allied Expeditionary Air Forces adapted the successful air tactics of the Middle East for the invasion of Europe. His interest in fighter tactics development and training continued after the War. From first Commandant of the Central Fighter Establishment, he became first post-War Commandant of Cranwell.

In 1949 he went to Pakistan to, as he put it, "jazz up" their young Air Force. In 1951, he was A.O.C. No. 12 Gp., then off to America to command the R.A.F. staff in Washington.

No story of Dick Atcherley's life would be complete without mention of his identical twin brother David. They were born in Fulford, Yorkshire, sons of Maj.-Gen. Sir Llewellyn Atcherley, Chief Constable of West Riding, and Lady Atcherley, an artist and pioneer lady cyclist.

At Oundle, headmaster Sanderson preached freedom and individuality, consecrated to service, a precept the brothers clearly took to heart. They started Service life in the approved Atcherley manner. At first medically rejected, David on account of kidney trouble, Dick because of his eyes, they tried again two months later when, as Dick recounted at the Cranwell Passing-Out Parade last December "The doctors got us mixed up, with a little help. I passed in with flying colours on David's eyes and he on the strength of my—er—slightly more vulgar but none the less useful contribution."

Dick at Cranwell won the Groves Memorial Trophy for his flying but David went into the Army, largely to please his father. Later, he transferred to the R.A.F. and when he caught up with Dick in rank, confusion reigned supreme. Even Dick's mastiff was baffled.

A glorious project of Atcherley Enterprises was an Atlantic "flight" aimed at hoaxing one and all. Richard was to take off from this side and then vanish. David was to have smuggled himself and a similar aeroplane by ship into North America beforehand and to appear out of the blue on time.

Air Vice-Marshal David Atcherley disappeared in June, 1952, while flying a Meteor from the Canal Zone to Cyprus, a grievous loss to the Service and to aviation.

One feels that Sir Richard spent the last years of his Service career in the best possible job he could have had, C.-in-C., Flying Training Command. His talents, his example, his devotion to the R.A.F., the terrific *fun* he got out of, and put into, a full and worthwhile life, must have inspired the young men under his command and convinced them that they couldn't have chosen a better career.

At H.Q., Flying Training Command, not so long ago, after a lot of V.I.P.s had departed, the Air Marshal provided the phrase to end this piece. He turned to his staff officers and said, with a big smile, "Well, chaps, that's over—now we'd better count the silver." This unique airman's Service career is over, but Dick "Batchy" Atcherley has many silver, and golden, memories to count.—WREN.

General Aviation News

NEW NAVAL HELICOPTER.—An order has been placed for Saunders-Roe P.531 five-seat helicopters for the Royal Navy. Recently the company announced plans for building "a batch" of production P.531s powered by Blackburn Turmo shaft-turbine engines.

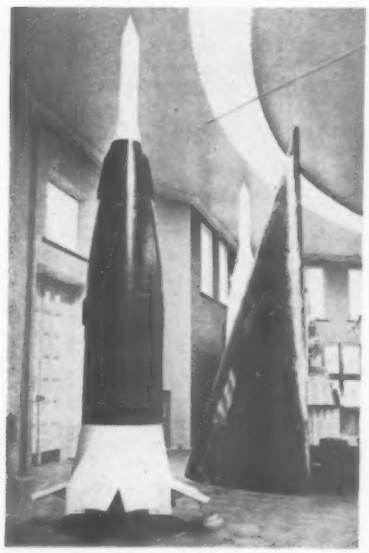
FLYING AGAIN.—The first prototype S-R.53 Viper/Spectre mixed-power-plant research aircraft flew for the first time since the crash, last June, of the second prototype. The flight was made on February 23 from Boscombe Down by the company's new chief test pilot, Lieut. Cdr. P. M. Lamb.

LICENCE-BUILT CONWAYS?—The Allison Division of the General Motors Corpn. is reported to be negotiating with Rolls-Royce, Ltd., for a licence to build the Conway by-pass engine.

M-B IN FRANCE.—A new company —Société d'Exploitation des Matériels Martin Baker—has been formed at 26 rue de Villiers, Levallois-Perret, by Martin-Baker Aircraft, Ltd., of Denham, and the Hispano-Suiza concern to manufacture the British company's ejection seats. The factory will be at Bois-Colombes. The first seats ordered are for the Dassault Mirage III.

ALTIMETER COMMITTEE.—The M.T.C.A. is setting up a committee to investigate altimeter mechanisms and presentations (see p. 277) and the possible use of visual and aural signals. The A.R.B., operators, manufacturers, pilots and navigators will be represented.

DC-8 QUINTET.—The fifth Douglas DC-8 made its first flight at Long Beach in mid-February. This was the first intercontinental model, with Pratt & Whitney JT-4A turbojets, and is destined for Pan American World Airways.



RUSSIAN ROCKETRY.—On show at the Russian National Economy Achievements Exhibition in Moscow is (left), the 1,045-lb. instrument container of the A3 geophysical rocket, which has a ceiling of 284 miles.

G.E. J85s.—Three versions of this lightweight 2,450-lb. thrust turbojet are seen here. The J85-1, in the foreground, is for the Northrop T-38 supersonic trainer; behind is the J85-3 which powers the McDonnell Green Quail decoy missile and, to the right, the J85-X for the North American Sabreliner.

100-km. RECORD.—A new World's record of 1,640 k.p.h. (1,018 m.p.h.) over the 100-km. closed-circuit course is being claimed for the Nord Griffon, powered by a SNECMA Atar turbojet. The existing record is held by a Douglas Skyray at 1,171 k.p.h. (728 m.p.h.).

ALL-BLOWN C-130.—A test-bed Lockheed C-130 transport is to be developed which uses boundary-layer control to give STOL performance in the assault-transport rôle. The aircraft will have a podded turbojet engine mounted on each wing outboard of the outer T56 turboprop engine. The turbojet engines will supply compressed air for blowing over the ailerons, flaps, elevators and rudder.

ON REGISTER.—Following the formation of Brantly Helicopters, Ltd., at Fforestfach, near Swansea, two Brantly B.2 helicopters have been registered in Britain, as G-APSE and G-APSF. Among other recent registrations are the Taylor Lowe-built monoplane as G-APRT (see THE AEROPLANE for December 5, 1958); the College of Aeronautics Morane-Saulnier MS.760 as G-APRU and the first of European Helicopters' Kolibrie H.3s as G-APRZ.

NAVY ELECTRA.—Another Lockheed Electra for the U.S. Navy, designated the YP3V-1, is scheduled to fly with a full complement of anti-submarine electronics equipment in the autumn. It is to have 4,050-e.h.p. Allison T56 turboprops. A new contract, valued at about £3 million, covers the purchase of a standard commercial Electra and its modification, development and testing. The first Navy Electra was illustrated in our issue of October 17, 1958.

MANNED AIRCRAFT FUTURE.—Sir George Gardner, director of the Royal Aircraft Establishment, has told the Canadian Aeronautical Institute that manned military aircraft would be required for a long time to come. He said "Enormous developments are in prospect in relation to both manned and unmanned flight and it will be very surprising if vital rôles for each are not selected in the future."

SPACE PRIMER.—Convair - Astronautics has produced a "Space Primer"—a 72-pp. educational booklet which introduces the basic principles of astronautics. It is a clear and concise guide to the theory and practice of rocket propulsion, the motion of bodies in space, satellite launching and orbits, and the techniques of space travel. Copies of the booklet can be obtained from Dept. 120, Convair-Astronautics, P.O. Box 1128, San Diego 12, California.

LATEST FIREBEE.—The XQ-2C Firebee is the latest Ryan target drone; it can operate above 50,000 ft. at high subsonic speeds.

BREGUET TAKE-OFF.—During recent tests at Toulouse the Breguet 940 Integral with blown wing took off in 287 ft. at a weight of 6.5 tons. A height of 50 ft. was cleared in 630 ft.

SOLAR CORRECTION.—The author of the note, in our January 23 issue, on "Solar-System Reconnaissance" has discovered a mathematical inaccuracy for which he apologises. He writes:—

"The specified velocity requirement of $x = 1.82$ miles/sec. corresponds to escape from a circular orbit around the Earth at an altitude of 1,000 miles, and not 2,000 miles as stated. The value at 2,000 miles would be $x = 1.66$ miles/sec. As pointed out in the appendix, variations in the altitude selected in the vicinity of the Earth have a relatively small effect on the results, but it is nevertheless desirable to associate a particular velocity requirement with the right altitude."

MORE NEWS ITEMS ON PP. 289-290.

Air Transport

Fares Compromise

AFTER something like six weeks of discussions, excluding periods of private conversation between groups of airlines, the International Air Transport Association's traffic conferences reached agreement last week on the major fare structure for 1959-60. As expected, the agreement was a compromise, with both factions in the turbojet surcharge controversy giving some ground.

Briefly, from April 1 onwards there will be a surcharge on the turbojet passenger fares over the North Atlantic and on services between North and South America, as well as a small increase ($5, or about £1 16s.) in first, tourist and economy fares for all types of aircraft flying on the North Atlantic and $15 (about £5 7s.) for de luxe fares. The turbojet surcharge will be $15 (about £5 7s.) for a single journey by tourist and economy class and $20 (about £7 3s.) by first and de luxe class.

A varying scale of similar surcharges will be added to both first and tourist turbojet flights between North and South America. There will be no turbojet surcharges in the Eastern Hemisphere, the fares for which were previously agreed at Cannes. New "creative" and inclusive-tour rates have been agreed for Europe, subject to certain rules, with reductions of up to 50% on existing tourist fares. Certain cargo rates over the North Atlantic have also been cut.

The effect of the Atlantic surcharges and increases can be summarized by quoting the single turbojet fares for the London-New York service; those charged before April 1 are given in parentheses: de luxe class, £185 15s. (£173 5s.); first class, £164 6s. (£155 8s.); tourist class, £119 4s. (£112 10s.); and economy, £97 4s. (£90).

Glad though everyone may be that a fairly harmless compromise has been reached, the result is an unhappy one in that Atlantic fares have been pushed up for all travellers. The original idea of a so-called fare differential was that reductions should be made in piston-engined (and possibly in turboprop-powered) aircraft fares so that the older type aircraft would continue to attract traffic while, at the same time, providing an overall downward trend in fares so that new markets could be tapped. Later, the problem became one of agreeing, or not, on some kind of surcharge for the turbojets.

The final result is that a surcharge has, in fact, been applied to the turbojet fares, but one that is inadequate as a means of encouraging passengers to travel in the older aircraft, though adequate, perhaps, to help the turbojet operators to cover the costs of the initial period of introduction of the turbojets. However, the new rates apply only for a period of a year and operators will have a chance to see how the traffic moves and to obtain hard figures before the next IATA traffic conferences are held towards the end of 1959.

Another 707 Incident

FOLLOWING, as it did, so closely upon the near-disaster to a Boeing 707 over the Atlantic, last week's incident in which an engine fell off one of these jet transports can only reflect adversely on its reputation. Incidents of this kind get widely (and not always accurately) reported in the World's Press, and anything like a series of incidents to the same type of aeroplane has a cumulative effect on the collective public mind.

On Wednesday, February 25, Boeing 707-121 N.709PA was on a training flight from Le Bourget with a Pan American crew of four and an F.A.A. observer on board. Instructor Capt. John Ryan was in command. Part of the regular training programme is that of demonstrating the characteristics of the 707 at and near minimum control speed and, in order to simulate the conditions after an engine failure on take-off, the two starboard engines had been cut back to idling power. The aircraft had been flying for about an hour after a 200,000-lb. take-off and its weight would have been some 180,000 lb. At the time of the incident the 707 was flying at 8,000 ft.

During the demonstration the speed was evidently allowed to drop below the safe minimum and the starboard wing dropped sharply away in an incipient spin, or stalled spiral dive. It is not, apparently, certain whether the powerplant was shed at the moment of the wing drop or during recovery, but the engine broke away in an outboard direction, taking away most of its pylon and damaging a wing-rib, but causing no other structural results.

Unless, in the meantime, further effects are found during inspection, it is proposed to complete the repair of the aircraft at London Airport, replace the power plant and pylon, and put the 707 directly into service. The mountings apparently failed at points where similar failure had been experienced during static tests under side loads at Seattle and not at the structural "fuses" which are designed to permit the power-plants to "rub off" cleanly in the event of a belly landing.

Once a recovery had been made, no great difficulty was experienced in continuing the flight to London Airport, where P.A.A. is better equipped to handle repairs than at Paris. The landing was uneventful.

Boeing and C.A.B. engineers flew to England immediately to make an on-the-spot investigation. Meanwhile, the 707 which suffered an auto-pilot failure en route from Paris to New York on February 3 is undergoing a complete examination at Renton, Seattle, in the course of which a small degree of radio-activity has been detected on its outer skin—the result, no doubt, of lengthy periods of high-altitude flying. Thus, two of P.A.A.'s fleet of six 707-120s are at present out of service, and two more are on lease to National Air Lines until the end of March.

VOR Until 1975?

THE battle of the short-range navigation aids has, for the moment, been won for a point-source system which is well understood and in fairly widespread use. An area-coverage system which is in comparatively limited use and is, maybe, statistically less reliable at its present stage of development, has been rejected by a majority of the governments represented in the International Civil Aviation Organization. The sponsored omni-bearing system works—and will no doubt work even better with the planned addition of means of distance-measuring—but an area-coverage system should have, in long term, better prospects of satisfying the needs both of air traffic control and of aircrews in the future.

That is the best simplified summary that can be offered of the results of the unhappy meeting at Montreal which was concluded last week. In fact, nobody in the business seems to have expected any kind of clear-cut result in favour of the U.K.-backed hyperbolic area-coverage system and almost from the very first day of the meetings it was obvious how the voting would go. The most that could have been hoped for was a compromise agreement which would give some kind of ICAO-sponsored blessing to the British system so that development and expansion could proceed under a blanket (however wet) of benign, if limited, international approval.

Towards the end of last week the leader of the U.K. delegation at Montreal, Gp. Capt. J. B. Veal, C.B.E., A.F.C., was asked by the Minister of Transport and Civil Aviation to return to London immediately for consultation. The opinion of the U.K. representatives was that the choice between the two systems was not being taken for objective, technical reasons and that the Decca system was not being judged on its merits. Consequently the delegation withdrew Decca from the voting and reserved the position of the U.K.

The views of the special committee which has been sitting in Montreal have still to go before the Air Navigation Commission of ICAO and the Commission's recommendations will then be considered by the Council of the Organization. The U.K. Government's attitude was due to have been stated by Mr. Harold Watkinson in the Commons last Wednesday.

Whatever the final voting last week may have meant, it does appear to the onlooker that some kind of area-coverage system, with direct pictorial presentation, is still wanted. The resistance to Decca has been the result of a complex of fears which were probably motivated less by reason of investment and prestige than is generally considered. The delegates were likely to have been much more afraid of throwing away the

(*Continued on page 275*)

the Caribou

. . . Introduces a new concept in transport aircraft design.

. . . The Caribou carries payloads up to 3½ tons – but is unique in its ability to operate from short, improvised air strips.

. . . Actual take-off distance – 490 feet with zero wind. (With a 10-mile headwind, take-off distance is 345 feet). Approach speed – 80 mph – and touch-down speed – 60 mph – enable the Caribou to land in 425 feet ground run. (300 feet with 10-mile headwind).

. . . Large rear loading door provides access to thousand cubic foot cabin, permits cargo dropping in flight.

. . . As civil transport, accomodates 27 passengers and baggage. As troop transport, 28 combat troops

. . . Air ambulance takes 14 litters, 6 sit-up patients or attendants.

. . . Structure is conventional, simple, rugged ... designed for minimum field maintenance and low operating costs.

. . . STOL ability enables the Caribou to operate from tiny jungle landing strips, from beachheads, or from short fields close in to centres of population – ushers in a new era of low-cost air transportation.

DE HAVILLAND AIRCRAFT OF CANADA

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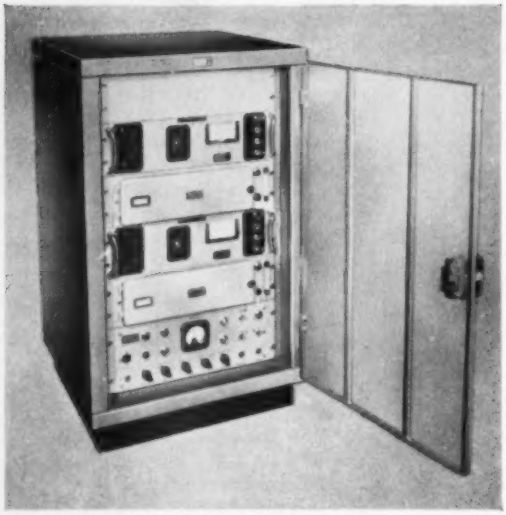

The low initial cost and relatively simple installation of the Plessey PVR.500 Terminal makes possible Radio Teleprinter links where previously they would have been uneconomical. Designed in collaboration with International Aeradio Ltd., the equipment is particularly suitable for regional point-to-point communication and meteorological broadcast at airports, also for Press Agency and similar work. Some of its many outstanding features are detailed below.

A comprehensive brochure is available on request. Please ask for Plessey Publication No. 168.

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Built-in metering arrangements provide for checking, setting up and monitoring of all important circuit functions. Direct operation of up to 3 Teleprinters; no keying relays are used, thus ensuring maximum reliability and freedom from radio interference. Five separate channels are pre-set and crystal controlled. Channel selection can be effected by the operation of one switch, while provision of crystal trimmers ensures that the frequency is exact.

The channel selector switch can be motor driven from the rear of the preselector unit, thus permitting remote control. Full remote control facilities are available.

F.S.K. Transmissions of differing shifts of 150–1200 c/s are catered for by Wide Band Discriminators. Narrow Band input Filters, plus Discriminators, ensure true F.M. detection with increase in signal to noise ratio.

Rapid diversity switch action on small signal differential over side range of inputs. Complete suppression of weaker diversity signal.

SI 10

(*Continued from page 274*)

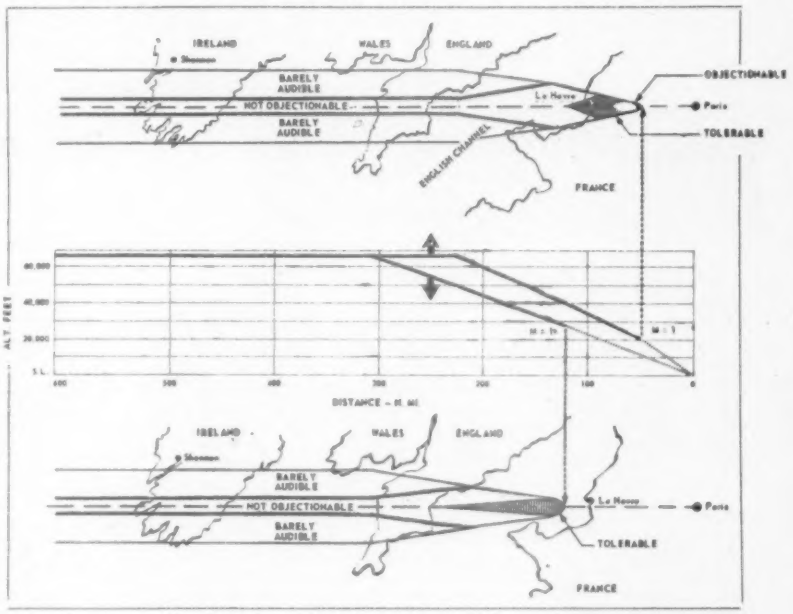
known for the comparatively unknown—which is an understandable reaction. Most of them were probably convinced in their own minds that a system such as that exemplified at present by Decca/Dectra will inevitably provide the beginnings of a final answer as communications become even more overloaded and as it is realized that ground radar must ultimately continue to be a means of monitoring rather than of controlling aircraft movements.

Meanwhile the VHF omni-directional radio range (providing continuous bearing information from a series of fixed ground positions)—supplemented in heavy traffic areas by the distance-measuring equipment developed for the U.S. Navy/Army Tactical Air Navigation System (Tacan) and making, in toto, VOR/DMET, or Vortac—has been approved as an international standard until December 31, 1974.

All that can be said is that the approval of a guaranteed period of 15 years of use for a particular pair of existing navigation aids is not particularly flattering to the intelligence and ingenuity of the World's electronic engineers.

Supersonic Airworthiness Requirements

A few impressions of a discussion, by representatives of the Air Registration Board and the U.S. Federal Aviation Agency, of some of the airworthiness problems likely to be posed by the supersonic transport of the future.



This diagram, which illustrated the paper read by Mr. M. L. Pennell of Boeing at the I.A.S. discussions in January (see THE AEROPLANE of February 13, pages 187-188) shows the calculated effects of the sonic boom from a supersonic transport climbing out of Paris on track for New York. It is assumed in the upper diagram that an optimum climb-path has been chosen and that the aircraft is transonic at an altitude of 20,000 ft. To avoid any discomfort on the ground the climb-path would be planned so that sonic velocity would be reached over the Channel at 30,000 ft. and the effects might be as shown in the lower diagram.

AN ingenious means was found by the Bristol branch of the Royal Aeronautical Society last week to get some new thinking on the difficult subject of airworthiness requirements for non-existent future supersonic transports.

The chief aerodynamicist of Bristol Aircraft, Mr. M. G. Wilde, outlined the design, performance and characteristics of a possible first-generation aircraft of this type and the invited representatives of the British and U.S. airworthiness authorities were asked for their comments on the specifications and the problems which might have to be met. The results of this original approach to a lecture session were nothing if not informing and the meeting provided quite a worthy kind of celebration of the 30 years of existence which the branch has now enjoyed.

The transport project—rather less than serious, but much more than a mere doodle—had been planned with the idea of offering some typical airworthiness problems for the future, but was deliberately designed so that it did not go too far beyond present-day knowledge. Thus, although it was a Mach 2.3 slim delta design—with prospects of very new handling and low-speed performance parameters—the structural materials proposed were conventional and the systems were of a kind which could be developed with present-day knowledge. In short, it was a reasonably possible first step into the supersonic era, but offering the kind of problems which will need to be met.

Various controversial features were introduced into the design. For instance, it was supposed that, whatever the future developments in automatic landings, normal means of visual and manual flying would need to be retained. Since the control-cabin windows and structure might be assumed to be the least reliable part of a highly pressurized structure, it was proposed that the captain might wear a pressure suit and be cut off by a pressure bulkhead from the remainder of the aircraft and that the first officer would be behind the bulkhead, using, if necessary, a periscopic viewing system. Again, it was proposed that the eight 16,000-lb. conventional turbojets used for propulsion should be grouped together at the tail, with a common, variable-geometry intake.

The airworthiness representatives invited to comment on this project were Mr. W. Tye, O.B.E., chief technical officer of the Air Registration Board, and Mr. R. B. Meyersburg, of the U.S. Federal Aviation Agency. Mr. Tye's contribution was delivered by Mr. D. M. Jameson of the A.R.B.

The general impression gained was that, whatever the confidence of its industry and technicians, this country will have a tremendous job on its hands in producing a successful supersonic transport without the help of the experience gained in military projects of a similar size and complexity—but that the job can be done if all the implications are thoroughly understood by everyone concerned.

For the U.S.A. the situation is different, with at least one Mach 3 bomber (the North American B-70 Valkyrie) coming along, and the F.A.A. representative at the lecture was able, so to speak, to relax in the knowledge that, when the time came for the certification of a supersonic transport, the airworthiness authorities would already have useful guidance.

The objective views of Mr. Tye and Mr. Jameson, whether speaking for themselves or for the A.R.B., were that it might not be sensible to go straight to the practical supersonic transport and that it might be better to do so in two steps. In any case success would depend on the maximum use of basic research, on a very thorough and well-planned testing and proving programme, and on an "intensive and extensive" effort by all concerned. There will be absolutely no point in going ahead with the project unless it is going to be technically and commercially successful and unless it is clearly understood that the initial costs are going to be very great indeed.

Among the many detail points made by Mr. Tye in discussing Bristol's supersonic Aunt Sally were these: Performance requirements for the slim delta might demand new datum points, choosing two or three speeds on a basis of operational realities. In planning the test programme it might be practical to consider the time spent by the supersonic transport in each of various operational régimes. Because of the difficulty of proving reliability it might be necessary to put in an expensive

number of testing and proving hours with prototypes unless information could be gained first with an intermediate type, or from military developments. New gust-strength requirements could be laid down only with a full picture of the structure of the entire atmosphere and this picture could only be obtained with the aid of a thorough programme of measurement and research.

Among the points made by Mr. Meyersburg were these: The present side-by-side flight-deck layout was basic and there would need to be very strong arguments against it if a departure from the rule were to be considered. He pointed to the fact that the B-52 had reverted to the side-by-side arrangement after experience with the tandem-seated B-47. Rearward facing passenger-seating might not be practical with the expected accelerations and climb-angles. Because of the sonic boom it would not be possible to enter the supersonic régime much below an operating altitude of 50,000 ft. Scientific planning and programming would greatly reduce the cost of testing. Suitable gust-data for use in assessing the strength requirements for supersonic transports were becoming available in the U.S.A. Future operational limitations might well be dictated by skin-temperature increases rather than by speed.

Flight Development of Civil Aircraft

A summary of the three-part lecture given before the R.Ae.S. in London last week by DR. A. E. RUSSELL, *Bristol Aircraft, Ltd.;* MR. C. ABELL, *B.O.A.C.; and* MR. P. F. GREEN, *Bristol Aero-Engines.*

OF the several objectives in flight development of a civil aircraft, that of establishing its reliability is the most difficult. "The initial reliability of most new aeroplanes, and especially their equipment," said Dr. Russell, chief engineer, Bristol Aircraft, Ltd., "can only be described as unsatisfactory." "Proof, or otherwise, of the reliability of the aeroplane, its engines and its systems," said Mr. Abell, chief engineer, B.O.A.C., "can only come with hard experience gained in actual airline operation. No amount of pre-service development flying has ever been able completely to eradicate all the development troubles, and the only way to improve the situation seems to be to buy an aeroplane which has been developed by some other airline."

Discussing the designer's responsibility towards achieving reliability, Dr. Russell stressed that this was one of the most difficult problems the designer had to face. The choice of airborne equipment should be based preferably on a previous satisfactory operational background, and the temptation to use even more complicated gadgets must be repulsed.

Development brings to light only some of the more malignant snags, while the so-called route proving period of 100 hours or so is no more than a symbolic gesture towards trouble-shooting. The settling-down period certainly takes many tens of thousands of hours and may take years. The conclusion is that pre-operational flying is too short to play more than a limited rôle in identifying and eliminating trouble spots.

Those who might seek salvation in greatly extended route proving, however, were in Dr. Russell's view approaching the task from the wrong end. It is much less expensive to submit component parts to more rigorous ground tests in correct environments, and to promote the status of equipment approval certificates to more exacting standards. The basic attack on this problem must come before the flight development, in the initial selection of equipment and components and in the care taken in their proper installation.

Mr. Abell stressed the need for high utilization rates to be achieved early in the life of a fleet. Aircraft of the 707 or V.C.10 type will cost B.O.A.C. £950 per day per aircraft solely for obsolesence and insurance, so utilization must build up to the maximum possible figure in the shortest possible time.

Planned utilization rates are very difficult to achieve if the aircraft is not reliable from the start of its operational life and, in conjunction with this, engines and components must be developed to a high degree to enable high hours between overhaul to be obtained from the start, and to be increased at a rapid rate in the first year to 18 months of service.

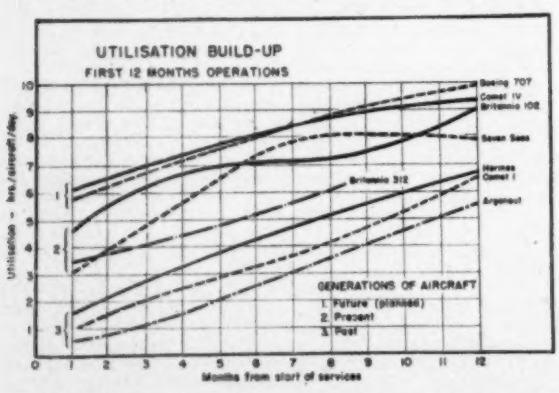
The importance of a proper integration of overhaul times was shown by Mr. Abell in a series of graphs. It was almost impossible to avoid having some surplus engines (at £90,000 or more each) after two or three years' operation; but more than are finally needed would have to be purchased if the engine overhaul period did not progress steadily or if the overhaul elapsed time was not quickly reduced to its minimum.

In the case of the Argonaut, B.O.A.C. held over 100% of the installed engines as spares to cover overhaul float, casualties, spares at route stations, etc. By cutting elapsed overhaul time from seven weeks to three weeks (and eventually perhaps to under two weeks) and improving the rate of increase of overhaul life, B.O.A.C. hope to cut holdings for future types to 60%; this improvement represents a saving in capital investment of almost £5 million on a fleet of 35 aircraft of the V.C.10 type.

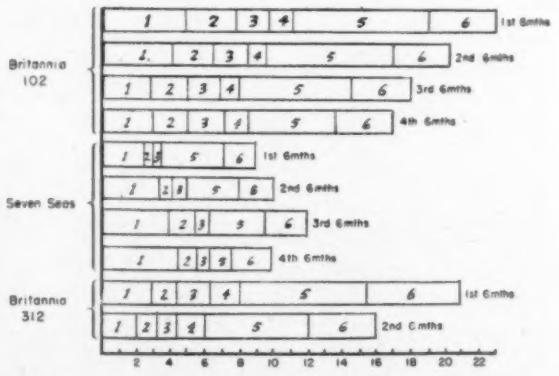
Another important factor affecting the achievement of high utilization and the planning of spares schedules, is the introduction of technical modifications. On the Britannia 102 there have been 1,450 engineering and technical modifications (excluding those to meet operational, catering and sales requirements) up to December, 1958. These could be broken down as follow: introduction of new equipment, 25%; rectification of defects without substantial redesign, 38%; improving performance or meeting higher standards, 9%; providing additional safeguards, 10%; and facilitating servicing, maintenance and inspection, 18%. The cost of these modifications in man-hours per flying hour has been 2.1 : 1, ignoring the cost of the new materials and the scrapping of the material made obsolete.

Mr. Abell agreed with Dr. Russell that flight development of civil aircraft had received far too little attention and careful thought in the past. Not nearly enough representative component and system testing had been done in the past or is being

(Continued on page 277)

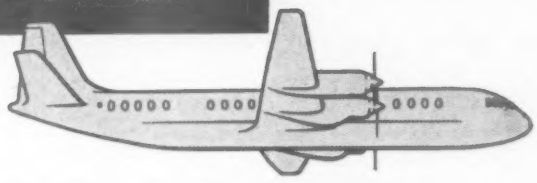


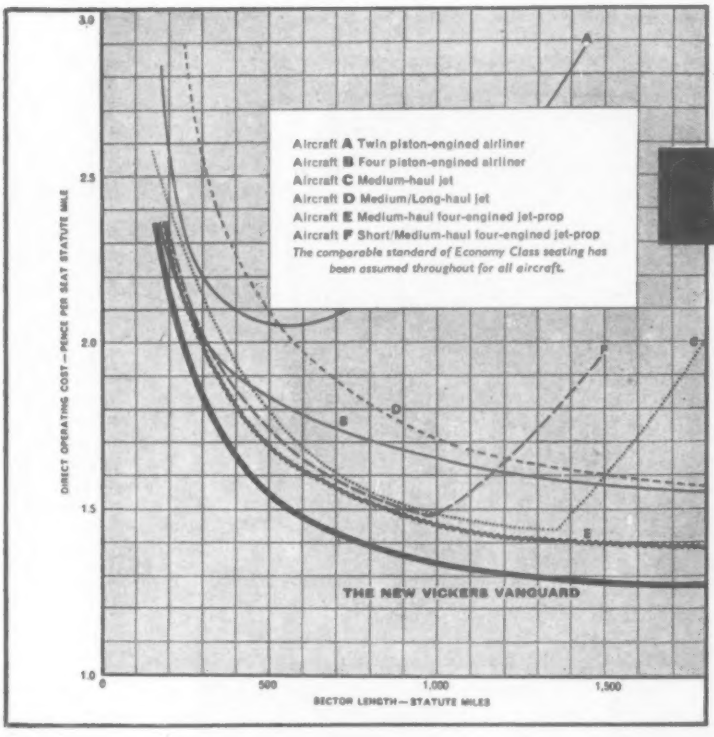
Planned and actual rates of utilization build-up of various types in B.O.A.C. service.



Engineering delays suffered per 100 take-offs by three types in B.O.A.C. service are shown here. Delays are divided into: 1, powerplant; 2, airframe and undercarriage; 3, hydraulics; 4, fuel system; 5, electrics and instruments and 6, miscellaneous.

LOWER FARES





yet

MORE PROFIT

The attraction of cheap rate tickets has already been proved on long distance routes. On North Atlantic flights 60% of all passengers now travel at economy fares.

A similar cut in fares would be equally popular on short and medium-haul routes, and be the means of boosting traffic considerably. The only aircraft capable of bringing about these reductions, *and* making a profit, is the Vickers Vanguard.

In its economy class layout, the Vanguard has over 50% greater profit potential than any competitive air liner. By a substantial margin its seat-mile costs are the lowest on offer today.

Only the VANGUARD has all these features

425 m.p.h. cruising · Seat-mile cost as low as one cent per seat-mile · Freight capacity 10 tons at normal densities · Full routing and A.T.C. flexibility · Can use normal existing airfields · Quick turn-round · No airfield noise problems · Quiet, smooth flight · Ten years' unique Vickers Rolls-Royce jet-prop experience.

What fare cuts are possible?

At 65% passenger load factor the new Vanguard, in its 139-seater economy layout, can operate at 10% clear net profit with fares ranging from 29-50% below current tourist rates. In calculating these figures actual routes, current fares and current costs have been used.

PROFIT with the NEW

VICKERS VANGUARD

FOUR ROLLS-ROYCE TYNE TURBO-PROP ENGINES

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED WEYBRIDGE SURREY

TGA AT599

E

. . . so I told your mother that the
largest particle allowed in turbine fuel
supplied by AIR **BP** is 5 microns—
about 1/5000th of an inch.

Darling, how tiny!

AIR BP

THE AVIATION SERVICE OF BRITISH PETROLEUM

(*Continued from page 276*)

done now. This may be expensive, but it is not so expensive as building aeroplanes and flying them for many hours or months; nor is it so expensive as modifying the system after introduction into service.

In future, more flying must be done in representative airline conditions. Mr. Abell suggested that the two Corporations are best equipped to do this quickly and relatively cheaply—but such flying should be done as a development contract and the operators should not be expected to foot the bill.

Mr. Green, Bristol Aero-Engines assistant chief engineer, said that the rate of build-up of overhaul life was a good yardstick of engine performance and reliability. One of the engine maker's problems was the small number of bench and flight hours which could be achieved compared with the number of hours achieved in operation. For instance, the Proteus achieved 30,000 hr. bench and air time in 3½ years before it went into service; this was equalled by operators in 18 months of service.

An interesting account was then given of the work done by Bristol to overcome the de-icing problems on the Proteus, and various stages of modification were illustrated. The accepted standard for commercial operation was a combination of cleaned-up intake ducts and the so-called "B-skin jets"; the "rabbit warren" ducting adopted by R.A.F. Transport Command was marginally better but much more expensive. An experimental cowling featuring flush N.A.C.A. intakes instead of the annular intake round the spinner had been tried on one proving flight to Singapore, and had been extremely effective. These intakes, however, induced vortices on the wing, and the increased drag resulted in a 4% penalty in range.

Seeing is Believing

BELOW, by way of an illustrative postscript to recent comments about altimeter presentations, are the three instruments about which these comments have been primarily concerned.

On the left is the standard three-pointer altimeter; in the centre is the new Kollsman needle-and-drum instrument; and on the right is the Kelvin Hughes Type 1504 which, with the similar Type 1603, is the presentation now approved as an interim means of preventing 10,000-ft. errors.

The three-pointer type of instrument has been in continuous and satisfactory use for nearly two decades and it is difficult to understand why it is that accidents and incidents, apparently caused by misreading, have been prominent only during the past two years or so. Undoubtedly there have been such incidents during the entire life-span of the instrument, but these incidents have not been such as to cause alarm.

In some positions of the needles it is possible to misread (or, more accurately, to be misled) when the smallest (10,000-ft.) needle is temporarily hidden behind the larger 1,000-ft. pointer. But it is difficult to understand how misreading of the two larger needles can, except in poor light, occur. After all, how often do we misread the hands of our watches? The fact remains, however, that accidents and incidents *have* happened because the aircraft's altitude was 1,000 ft. or 10,000 ft. less than that supposed by the pilots.

The needle-and-drum (or counter) type of presentation should, in theory, be absolutely unambiguous, but after a good look at the example illustrated it will be seen that (particularly at very low altitudes) it might be possible to be misled by the position of the digits on the moving counter in relation to the lubber-line. The answer, presumably, is to have a positive "click" action for the drum so that it moves only from one whole figure to another and to have a window in which only one whole numeral is shown. Such an action would need to be motorized—the barometric capsule has quite enough of a struggle (except at low altitudes) to provide the power for the simple, direct movement of hairspring-loaded needles or drums.

A number of different three-pointer and counter altimeter presentations have been offered in recent years, but the main feature of the dial now approved by the A.R.B.—who have been primarily concerned with 10,000-ft. errors—is the use of a warning flag. This, in the picture on the right of the Kelvin Hughes instrument, can be seen appearing in the window on the left of the face as the altitude drops below 15,000 ft.

This type of flag indication has been, for some time, a requirement of test pilots who may need to dive from high altitude above cloud and who, when the needles may be going round like those of a clock with a broken escapement, need some positive indication of the height at which a pull-out must be initiated.

As explained in last week's issue (p. 240) the 10,000-ft. needle is full-radius and has a bell-shaped pointer as well as an annular marker, at mid-radius, which "follows" the needle and shows clearly its angular position whatever may be those of the 1,000-ft. and 100-ft. pointers.

The U.S. Federal Aviation Agency has now raised the minima for Boeing 707 operations pending the installation, in the captain's flight panel, of a three-pointer altimeter in addition to the needle-and-drum instrument. Unless ILS or PAR (precision approach radar, or GCA) is available and used, approaches are not to be conducted in conditions below 1,000 ft. cloud base and 1½ miles visibility (2 miles by night). Operational difficulties with the new altimeter system have recently been experienced by crews of the 707.

Altimeter Error Confirmed

MISREADING of the altimeter by 10,000 ft. was given as the cause of the accident to the B.O.A.C. Britannia 312 near Bournemouth on Christmas Eve, when the coroner summed up at the inquest last week. The first officer, who survived, said that a descent from 13,000 ft. over Hurn was part of the test programme on which the Britannia was engaged.

Permission was obtained from control to descend from 13,000 ft. to 3,000 ft.; altimeters would have been cross-checked at 10,000 ft. but the aircraft crashed before this cross-check took place. He did not believe that either he or the pilot had misread the altimeters, but thought there must have been something wrong with them.

According to an M.T.C.A. accident investigator the altimeters were recovered from the wreckage, tested and showed no sign of malfunctioning.

These photographs show the three altimeter presentations discussed in the article above. On the left is an example of the standard three-pointer type which is indicating an altitude of 35,940 ft.; in the centre is the new Kollsman single-needle-and-drum instrument which is showing an altitude of about 17,100 ft.; and on the right is the new A.R.B.-approved Kelvin Hughes presentation which is indicating an altitude of 12,000 ft.

The Fighting Services

Air Rank Appointments

AIR COMMODORE J. N. TOMES, C.B.E., who has been serving with the Defence Research Policy Staff (Air) at the Ministry of Defence for the past two years, has been appointed Air Attaché at Bonn from March 24. At Headquarters, Bomber Command, from 1951 to 1953, Air Cdre. Tomes commanded R.A.F. Binbrook for two years until going to the Air Ministry as Deputy Director of Bomber Operations in 1955.

Group Captain T. E. J. Fitton is to become Senior Technical Staff Officer, F.E.A.F., with the acting rank of Air Cdre. on March 23. Until recently Deputy Director of Technical Services, Gp. Capt. Fitton was previously S.A.S.O. at No. 24 Group. From 1953 to 1955 he was Chief Aeronautical Inspection Officer at Headquarters, Maintenance Command.

Flying Scholarship Scheme

THE Air Ministry's free flying scholarship scheme for members of the Air Training Corps and the R.A.F. sections of the Combined Cadet Force had by the end of 1958 trained 2,310 air cadets of between 17 and 19 years of age to fly a light aircraft solo. About 1,000 of them have entered the R.A.F. for flying duties, some having gained their scholarships when the scheme started in 1950. Some have flown, or are flying, with University Air Squadrons, and others have served in various capacities with the R.A.F. Volunteer Reserve.

There are still 783 qualified fliers with their cadet units. Others are in the Royal Navy and the Army, and over 100 are students at universities and technical institutes or are apprentices in industry. The number of vacancies for flying scholarships in the financial year 1958-59 was 350. The same number is expected in 1959-60.

The Masters of "Hackmanship"

AT its annual dinner at Imperial College on February 20 the toast to the University of London Air Squadron was proposed by Sir Edmund Hudleston, Vice-Chief of the Air Staff, who reported that nine members had taken commissions in the R.A.F. during the past year.

He also stated that the estimated number of flying posts for pilots in the Service up to 1970 is 2,800. With the present wastage rate the maintenance of this figure required up to 280 pilots each year, but due to various causes an intake of 450 was necessary to meet the requirement. An average G.D. officer could expect to fly for 10 to 15 years of his first 20 years of service.

If there is any truth in the saying that "a change is as good as a rest" the Squadron should touch even greater heights in the coming 12 months and maybe become the first university air squadron to win the Hack Trophy for the third consecutive year. For during the past year it has, with all other university squadrons, been transferred to new management in the form of Flying Training Command; moved from its old home at Biggin Hill to new premises at White Waltham, and had a number of postings in its officer complement.

In summing up these events the new C.O., Wg. Cdr. V. Rees, reported that he considers the unit to be mobile as well as successful, and masters of the art of "Hackmanship." He also welcomed members of the new management at the dinner, who were led by their retiring A.O.C.-in-C., Air Marshal Sir Richard Atcherley.—P.R.R.

Awards for Gliding

SERVICE gliding and soaring pilots have won four out of the six cups and trophies which constitute the British Gliding Association's annual awards for 1958, and which are to be presented at the annual gliding ball at Londonderry House by Mr. P. G. Masefield on March 13. Never before have the R.A.F. made such a sweep of the awards, and their triumph will encourage the strong team the Service is entering in the 1959 National Gliding Championships at Lasham, Hants (May 9-18). Three of the R.A.F. winners are members of the 10-year-old R.A.F. Gliding and Soaring Association.

The de Havilland Cup for the greatest gain in height is awarded to Flt. Lt. A. T. Morgan, Fighter Command, for his winning climb of 15,340 ft. made last August in an Olympia at Nympsfield. The previous holder was Sgt. J. Williamson with 26,500 ft. in 1957 (the U.K. record).

The Wakefield Trophy for the longest flight of 1958 has been won by Sgt. A. W. Gough, of R.A.F. Wildenrath. This is for his flight of 348 miles from South Cerney to Heerlen on the Dutch-German frontier in a Skylark 3.

The Volk Cup for the best out-and-return flight of the year has been awarded to Sgt. J. Williamson, of R.A.F. Yatesbury, and Mrs. A. Welch for their 102 miles in a T.42 from Lasham to Westbury and return.

The Seager Cup, awarded for best two-seater performance, has gone to Flt. Lt. W. A. H. Kahn, R.A.F.V.R., and Sgt. Williamson for their goal flight from Odiham to Perranporth in a T.42, a distance of 195 miles, at 43 m.p.h.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Wg. Cdr. G. P. S. Thomas, O.B.E., to the Department of the Air Member for Supply and Organization, with acting rank of Gp. Capt.

Bomber Command: Wg. Cdr. H. B. Hunt, D.S.O., D.F.C., A.F.C., to Headquarters for flight safety duties; Wg. Cdr. D. N. Shepherd, D.F.C., to R.A.F. Honington to command the Administrative Wing; Wg. Cdr. E. F. Brown, D.F.C., to R.A.F. North Luffenham to command the Administrative Wing.

Fighter Command: Wg. Cdr. J. H. S. Broughton, D.F.C., A.F.C., to R.A.F. Duxford to command the Administrative Wing.

Technical Training Command: Wg. Cdr. E. J. Tippett to No. 3 Radio School, Compton Bassett, as education officer.

Maintenance Command: Wg. Cdr. R. E. Cooke to No. 7 M.U., Quedgeley, for administrative duties.

Signals Command: Wg. Cdr. R. C Patrick to R.A.F. Watton to command the Administrative Wing.

Middle East Air Force: Sqn. Ldr. S. M. McGregor to R.A.F. Ayios Nikolaos, Cyprus, to command, with acting rank of Wg. Cdr.

Miscellaneous: Wg. Cdr. P. W. Helmore, D.F.C., A.F.C., to Air Headquarters, Malta, for Air Staff Duties; Wg. Cdr. W. T. H. Howell, D.F.C., to British Forces, Arabian Peninsula, to command R.A.F. Steamer Point; Wg. Cdr. J. M. Littler to Allied Forces Northern Europe for staff duties; Wg. Cdr. H. Simmons to SHAPE for staff duties.

Reunion

W.R.A.F. Officers' Association.—The fourth reunion will be held at the Victory Club, London, W.1, on May 23 between 16.00 and 18.30 hrs. Tickets, price 8s. 6d. each, can be obtained from the Hon. Secretary (Room 437), Air Ministry, Adastral House, London, W.C.1. The Association is open to all former W.R.A.F./W.A.A.F. officers as well as serving officers.

ENDURANCE FLIERS.—As we recorded last week, a Shackleton MR.3 of No. 206 Squadron, R.A.F. Mawgan, has logged an endurance record for this type by staying airborne for 24 hr. 21 min. The tired but happy crew are seen after their flight, with the aircraft's captain, Flt. Lt. D. R. Foster, second from the left, front row.

Report on Japan's Aircraft Industry

by

John Fricker

WORLD WAR II provided an unexpected and, for the Western powers, an unpleasant demonstration of ingenuity and efficiency on the part of the Japanese aircraft industry, which at its peak employed more than 580,000 personnel. Although the motivating spirit behind that industry has happily changed, the complete destruction and dispersal which it underwent, plus the subsequent superimposition of foreign technical resources during its reconstruction, has enhanced rather than diminished its wartime reputation.

There is, of course, no comparison in size between the present and past aircraft industries in Japan, as shown by the fact that in less than a week in that country I was able to visit the offices or factories of five of the six main companies. But this reduction in size applies equally to every other national aircraft industry, and rather more to some, as we have recently seen.

In general, one's impression is that Japan's technicians and engineers are rather better off for a period of enforced absence from aircraft design and manufacture, although there are a number of obvious disadvantages in being out of touch with such rapidly moving occupations. To a large extent these shortcomings began to be rectified immediately after the promulgation of the Peace Treaty in April, 1952, when once again the aircraft industry was permitted to operate, under close control of the Japanese Government.

The Korean War was then in full swing, and to simplify the massive logistics problem in the Far East, the local U.S. Air Force formations, not to mention the substantial aviation units of the Army and Navy, handed over most of their major maintenance and overhaul problems to the infant Japanese industry. Several of the aircraft companies had already been established for a couple of years under different names for the manufacture of machinery and equipment unconnected with aviation, and their reorganization was relatively simple.

In most cases the firms had returned to occupy their main wartime facilities, and had regained nearly all their senior personnel. To perform precision work on the latest American military aircraft the Japanese companies were assisted by the U.S. authorities in obtaining modern test and other equipment, and given valuable technical advice.

The first servicing and overhaul contract was awarded in July, 1952, by the U.S. Air Force to Showa Hikoki, which was joined in 1953 by the Kawasaki Aircraft Company. In 1954 the latter company added turbojet engines to its airframe-overhaul contracts, which were later also awarded to Nippon Hikoki, Shin Mitsubishi and Shin Meiwa, to include the servicing of navigational, electronic and radio equipment. In logical succession came technical assistance contracts with American companies, on a royalty basis where manufacture was involved.

From there, it was a relatively short step to the assembly under licence of complete aircraft, with component parts, jigs and tools provided by the U.S. companies. Several light aircraft were also designed and constructed by one or two of the Japanese companies, and it was not long before the complete manufacture, except for their powerplants, of jet aircraft and helicopters was being undertaken under licence.

The stimulus for this rapid expansion had come from the establishment of the Japanese Self-Defence Forces, the ground and maritime elements of which each included an aviation arm, in addition to the Air Self-Defence Force. All the aircraft for these units were initially supplied under the American mutual aid programme, but the majority of the new equipment is now being manufactured under licence in Japan. The total strength of the JASDF at the end of the current financial year will be about 1,100 aircraft, plus more than 200 machines in the Ground SDF, and a similar number in the Maritime SDF.

The ultimate development stage of the Japanese industry was reached in late 1957 with the completion of the first indigenous design for a military jet trainer, which is now being built in quantity for the JASDF. At the moment, however, it uses a foreign powerplant, engine development inevitably having taken longer than the airframe side of the industry. British power units are also used in the second Japanese design, which is for a civil transport, and is described in detail elsewhere in this issue. To sum up the post-War industry in Japan, by mid-1958 it had produced 533 aircraft, although these accounted for only 66% of its effort, the remainder being engaged on repair and overhauls. Total personnel amounted to 16,000, and factory floor space was 114.24 acres.

Having described the background to this rebirth a detailed report on the individual companies can be given, following our recent visit.

Fuji Heavy Industries, Ltd.—One of the "Big Three" among the Japanese aircraft companies, Fuji is the post-War name of the former Nakajima Aircraft, and was re-established on July 15, 1953. Prior to that date one of the five subsidiary companies into which Nakajima had been split was engaged in the construction of rolling stock at Utsunomiya, not far from Tokyo, and part of the plant at this airfield was taken over for

Top, Kawasaki-built Lockheed T-33A jet trainers of No. 3 Flying School in precise formation during advanced training. Primary instruction is given (left) on Beech T-34 Mentors, built under licence by Fuji.

aircraft production. Several other factories were made available for the aircraft activities of Fuji, which also extended to a second airfield at Ota.

Negotiations with the Beech Aircraft Corpn. resulted, in November, 1953, in the acquisition of a licence for the construction by Fuji of the T-34 Mentor primary trainer for the JASDF, and this was subsequently developed into the LM-1 Nikko communications aircraft for the GSDF. Another licence was obtained, in September, 1956, for the production of the Cessna L-19 liaison aircraft for the GSDF, overhauls of this type, together with the T-34, having been already undertaken for the U.S. Army and Japanese forces.

Delivery of the Fuji-built T-34 Mentor to the JASDF began in August, 1955, following the assembly of 49 similar aircraft from U.S. manufactured parts. Production has continued at up to 12 aircraft per month, about 100 having been built by the end of 1958. Deliveries also began in that year of the first of 36 T-34s for the Philippine Air Force, these being procured by the Japanese Government as part of wartime reparations.

Developed from the Bonanza, from which it differs mainly in the tandem-cockpit layout and conventional instead of V-tail, the T-34 is a sturdy and useful primary trainer, although intended for an instructional phase which is not now included in the R.A.F. syllabus. In the JASDF it is used at the No. 1 Flying Schools for three months' *ab initio* training, during which about 55 hr. are flown before proceeding on to T-6 Harvards. This period on T-34s is due to be doubled when the Fuji jet trainer replaces the T-6s early in 1960.

With characteristic enterprise the Japanese technicians at Fuji also set about reconverting the T-34 back virtually to Bonanza standards as a four-seat liaison and communications aircraft. Some indication of the room available in the two tandem cockpits of the T-34 is given by the fact that a fairly simple modification to the upper centre fuselage resulted in accommodation for four-five occupants under a long metal-roofed canopy.

As the Fuji LM-1 Nikko, the new aircraft was completed as a prototype in June, 1955, the gross weight having been increased from the 2,976 lb. of the T-34 to 3,527 lb. The powerplant remained the 225-b.h.p. Continental O-470-13A, imported from the U.S., and something like 90% of its spare parts continued to be interchangeable with the T-34 or Bonanza.

With a large removable hatch in the cabin roof, the Nikko is suitable for the carriage of light freight or for ambulance and many other duties, and its versatility resulted in an order in 1956 for 27 LM-1s for the Ground Self-Defence Force. These were paid for by the United States under offshore-procurement, and have since been delivered to the GSDF.

Flying the Nikko

The type is also available for civil use, and during my visit to Utsunomiya I was able to make a brief handling trip in Fuji's red and cream demonstrator, JA 3098. In the left-hand seat on this occasion was T. Yoshizawa, Fuji chief test pilot, and wartime Nakajima pilot, who had also flown most of the captured U.S. aircraft in World War II. He apologized for the fact that I was not able to enjoy a full flight assessment, since the right-hand seat was not then provided with rudder pedals, but an extension arm with a duplicated wheel control enabled general handling to be sampled in the air.

As well as for the JASDF, production of the T-34 by Fuji is now in progress for the Philippine Air Force, under war reparations.

Except for the length of the cabin, which made it seem narrower than it was, the interior seemed to differ little from the Bonanza. The instrument layout also appeared familiar and I certainly remembered the central plunger-type throttle, with its rotating vernier control for minor power adjustments. American instruments and radio were fitted, so there were few problems of interpretation from the aeroplane. As in NATO, English is the universal language of flight planning, control and military procedures in Japan, although it is spoken rather less on the ground.

I gathered that, like the Bonanza, ground steering of the Nikko is by nosewheel movement from the rudder pedals, and manœuvrability is good. With its two wing-root tanks having their full complement of 60 U.S.-gal. of fuel, and three persons on board, the Nikko leapt off the long runway at Utsunomiya with impressive vigour and climbed away at a healthy 1,500 ft./min. indicating on the V.S.I.

From the cruise at 125 knots I.A.S., Mr. Yoshizawa pulled straight up into a stall without altering the power setting of 20-in. Hg. and 2,100 r.p.m. As in the "all-down" configuration, the stall was quite straightforward after a brief preliminary buffet and a small loss of height. Slight consternation on the part of a normally non-flying passenger in the rear seat increased noticeably when, after being invited to emulate a series of semi-stalled turns by the pilot, I was interrupted in a steep dive by a loud bang, followed by a prolonged roar.

Thoughts of the wings having fallen off were dispelled by recollection of the 6-*g* load factor of the design and a pronounced draught, which led to the discovery that the ventilator in a side window had been sucked out. A gold-toothed grin from the left-hand seat indicated that this was a huge joke, but I thought the rear seat looked rather wan.

The point of this story is that the controls of the Nikko/T-34/Bonanza are sufficiently light and responsive to invite light-hearted abandon and, in fact, the aircraft is very pleasant to fly. As the figures show, the LM-1 has a remarkably good cruising range and fully maintains the well-known efficiency of the Bonanza.

A brief handling flight in the Fuji LM-1 Nikko (left) was made by the author with T. Yoshizawa (below, left), at Utsunomiya. Below, the supercharger air intake for the more powerful Lycoming engine of the KM-1, and the three-bladed Hartzell airscrew are apparent in this photograph.

Photographs copyright "The Aeroplane"

Because of the mountainous terrain and variable weather in Japan a requirement was evolved for a development of the Nikko with improved high-altitude performance, and additional instrumentation and electronic equipment for prolonged IFR flight conditions. This was basically met by the installation of a supercharged Lycoming GSO-480-B1A6 engine developing 340 b.h.p. for take-off, and driving a three-bladed Hartzell airscrew, in an LM-1 airframe, which was redesignated the LM-2, or Super-Nikko.

It was also fitted with additional flight aids, including the American military ADF equipment Type ARN-6, and the Scott lightweight oxygen system approved by the C.A.A. for business flying. A newly designed heat exchanger has almost twice the output of the cabin heater in the Mentor and LM-1, but despite the additional equipment and bigger engine, the empty weight of the LM-2 was increased by only 278 lb. The optional fifth seat was therefore removed, but with the supercharged engine the LM-2 is able to climb at 800 ft./min. at 14,000 ft. with four people on board.

Redesignated the KM-1, the Super-Nikko made its first flight on December 1, 1958, at Utsunomiya, and is now planned for production. An interesting point is that as a direct derivative of the T-34 the KM has similar provision for two wing-mounted 7.7-mm. M-2 machine-guns, and underwing bomb or rocket racks. It is also available for all the LM-1 conversions, such as for vertical photography, cargo-carrying, supply-dropping, and so on. Much additional electronic equipment

may be fitted if required, and provision is also made for full wing, tailplane and airscrew de-icing.

The KM-1 also retains the full aerobatic capabilities of the Mentor, which has been tested and certified for a load factor of +6.6*g* at 3,000 lb. gross (+4.4*g* with four people). The Super-Nikko, with its full dual control, may therefore be used with two up for tactical training up to 20,000 ft. Comparative figures for the LM-1 and KM-1 (in parentheses) are:—

DIMENSIONS.—Span, 32 ft. 10 in.; length, 25 ft. 11¼ in.; height, 9 ft. 7 in.; wing area (gross), 177.6 sq. ft.

WEIGHTS.—Empty, 2,213 lb. (2,491 lb.); useful load, 1,314 lb. (1,056 lb.); max. gross, 3,527 lb.

PERFORMANCE.—Max. speed, 184.5 m.p.h. at sea level (223 m.p.h. at 7,800 ft.); cruising speed at 60% power (186 m.p.h.); time to 9,850 ft., 17.9 min. (7.2 min.); service ceiling, 14,100 ft. (24,930 ft.); range, 975 miles at 124 m.p.h. at 2,950 ft. (708 miles at 167 m.p.h. at 9,850 ft.); minimum speed, 55 m.p.h.; take-off run to 50 ft., 2,000 ft. (1,240 ft.); landing run from 50 ft., 1,200 ft.

Fuji's Jet Trainer

Sharing the hangar with the LM-1, KM-1 prototype and sundry Japanese and Philippine Air Force T-34s at Utsunomiya, where during the War up to 300 Ki-84 Hayate fighters were produced per month, was a prototype of Fuji's shapely jet trainer, the T1F2. This particular aircraft was the third prototype, which had been flying for several months, and I saw the fourth aircraft of the series nearing completion in the shops. In all, six T1F2s will be built for the development programme, after which the production of a further 100 or so is contemplated.

The history of this first indigenous major type began with a design competition for a Japanese intermediate jet trainer, for which Fuji was awarded a development contract in July, 1956. Power unit for the T1F1 was specified as the Japan Jet Engine Company's J-3 turbojet of about 2,600-lb. thrust, which will be discussed in greater detail later in this account. As this had not completed its development programme in the remarkably short time taken for the detailed design of the airframe to be completed, the 4,130-lb. thrust Bristol Orpheus B.Or.1 was specified as an alternative for the initial batch of aircraft.

With this considerably more powerful engine, the design was designated the T1F2. The prototype was completed on November 20, 1957, and first flew on January 19, 1958, in the hands of Col. Takaoka of the JASDF. The second prototype T1F2 flew in February, and after initial flight testing both aircraft were delivered in March to the Engineering Research H.Q. of the National Defence Agency, for evaluation and operational trials. A third aircraft was built for structural testing, including fatigue testing of the pressure cabin.

The T1F2 is intended as a replacement for the venerable T-6 Harvards of the JASDF, and has a wing loading midway between the T-34 and T-33. For a more general comparison it falls somewhere between the Air-Fouga Magister and the Vampire Trainer in its intended instructional application. Examination shows it to be a competent and attractive design, with comprehensive equipment and a promising performance. Although bearing a general resemblance to the Sabre, to which it is dimensionally similar, the T1F2 has a cockpit layout based largely on the Lockheed T-33, and uses a great deal of American equipment.

As the T-33 is used for advanced training by the JASDF, the similarity of the T1F2 cockpits is logical and should make transition relatively simple. Instrumentation is entirely American, with the standard military ARN-6 ADF, UHF, and IFF, while T-33-type ejection seats are fitted. The instructor in the rear is seated 5 in. higher than the front occupant, and has a good forward view through the long "tube" canopy.

Unlike the T-33, the T1F2 does not have power-assisted controls. Spring tabs were originally fitted, but have since been removed, the ailerons and elevators simply having internal balance seals. With its 26.7° swept wing of 15.5% root and 13.5% tip thicknesses, the T1F2 has a critical Mach number of 0.85, and apparently handles well up to that speed, with no undesirable compressibility effects.

Final wind-tunnel tests of the T1F2 were undertaken by the Cornell Aeronautical Laboratory in the U.S., where the high-speed aerodynamic characteristics were explored up to M=0.9.

The wing is fitted with Fowler-type flaps, of 27.13 sq. ft. area, the inner angled sections of which are double-slotted to reduce buffet. Another buffet-reducing measure is the fillet below the fixed tailplane, extending out into a prominent "beak" to smooth out turbulence around the elevators at M=0.83. In common with the trimming surfaces on the ailerons, the elevator tabs are thicker in section than the surrounding structure, and project aft of its trailing edge.

The Japanese think very highly of the Orpheus engine (B.Or.3 in the third and fourth prototypes) which is conventionally mounted in the rear fuselage. This separates just aft of the wing for powerplant access, the engine being fed from a simple divided intake in the nose. Forward of the engine bay is a fuselage fuel tank, and additional tanks filling the wings bring the total capacity to 304 Imp. gal. Attachment points are provided beneath the wings for two standard Sabre drop-tanks

Production of the Cessna L-19E for the GSDF in addition to overhaul for the Japanese and American army liaison units is undertaken by Fuji at Utsunomiya.

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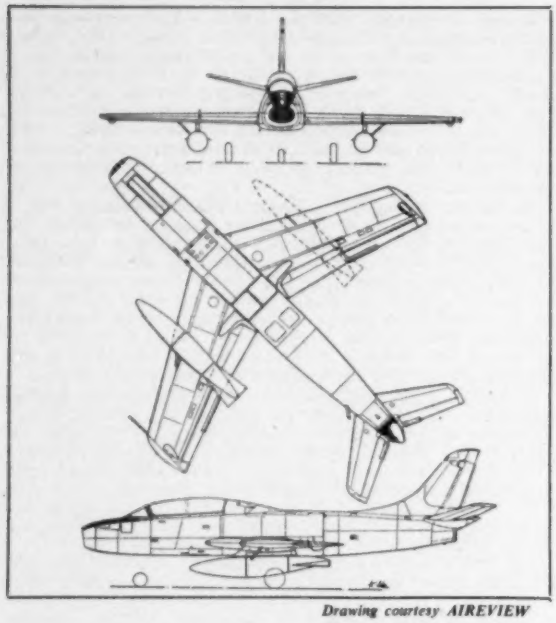


Drawing courtesy AIREVIEW

(which are manufactured in Japan) and these bring the maximum fuel load to 504 Imp. gal.

The tank attachments may be used for alternative armament loads of bombs, rockets, Napalm, Sidewinder missiles, gun packs or other loads up to a total of 1,500 lb. For gunnery training, a single 0.5-in. Browning machine-gun can be installed in the nose, although the prototypes are without armament at the moment.

With the exception of the electrically operated (by AiResearch) canopy, the T1F2 uses hydraulic power for its various services, including undercarriage, ventral air brake and flap actuation. The sturdy nosewheel undercarriage has low-pressure (70 p.s.i.) Goodyear tyres with wheels and brakes by the same company, but the steering facility on the first two prototypes has been discontinued.

With the Orpheus engine the T1F2 has a better performance at high altitude than the T-33, although it is slightly slower at lower levels. As an experiment the first prototype was fitted with rounded wing tips, which extended the span by 2 ft., to improve the climb at high altitude, as well as to increase lateral stability and reduce the landing speed. Production aircraft, however, will continue with the original square-tip contours, and slightly less area than the original 245 sq. ft.

The first 20 Fuji trainers with the Orpheus to be built in 1960 will be redesignated T1As, while the subsequent 90 T1F1s with the J-3 engine will be known as T1Bs. The T1B will naturally be well down on performance on the present output of the J-3 turbojet, compared with the Orpheus, and it is not known how this discrepancy will be catered for in the training programme. When the T1A is introduced next year at the No. 2 Flying Schools, one of which is alongside the Fuji plant at Utsunomiya, the number of T-6s will be decreased from about 170 to 60, and the present strength of 250 T-33s in the JASDF will also be slightly reduced.

The intention is to decrease the cost of pilot training, and it is hoped that the introduction of the T1A will cut the total expense by about one-third. Less time will be spent on the T-33, and the possibility of *ab initio* training on the T1A is being hopefully considered. Instructor training on the T1A will begin this summer, in preparation for the start of intermediate jet training in early 1960.

Production of the Fuji trainer is spread throughout the Japanese industry on a subcontracting basis. In the shops at the time of my visit were the Kawasaki-built rear fuselages of the fifth and sixth aircraft, but these components will subsequently be built by Nippon Hikoki. An interesting feature was the use of a heated polythene "tent" placed over the fifth fuselage while it was being worked on, to dry out the sealant of the pressurized cockpit.

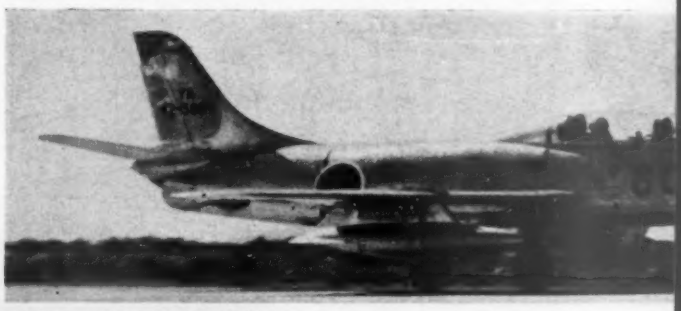
Leading particulars of this interesting Fuji design, which may well have a considerable export sales potential, are (with Orpheus):—

DIMENSIONS.—Span, 34 ft. 5 in.; length, 39 ft. 9 in.; height, 13 ft. 4 in.; gross wing area, 239 sq. ft.; tailplane area (inc. elevator), 52 sq. ft.; vertical tail area, 29 sq. ft.

WEIGHTS.—Normal gross, 8,800 lb.; with external tanks, 10,700 lb.

PERFORMANCE.—Max. level speed (clean), 484 knots at 20,000 ft.; average cruise speed (with drop tanks), 290 knots, T.A.S.; initial climb (clean), 6,100 ft./min.; with drop tanks, 4,600 ft./min.; time to 33,000 ft. (clean), 8.2 min.; range, including reserves, with external fuel, 680 n.m.; endurance, 2.76 hr.; overload take-off run, 1,530 ft.; to 50 ft., 2,350 ft.; landing run, half-fuel weight, 1,900 ft.

The remaining activities of Fuji at Utsunomiya are concerned with the production of Cessna L-19Es for the GSDF. By



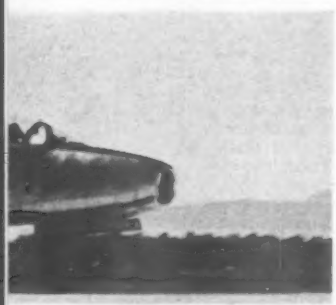
With flaps and ventral air brake extended, and carrying Sabre-type underwing tanks, the prototype T1F2 is seen landing at Utsunomiya. This view emphasises the higher seating position of the instructor in the rear seat, and shows the anti-buffet "beak" over the Orpheus tailpipe.

Left, a revealing photograph of the prototype Orpheus-powered T1F2, the entire cockpit section of which is based fairly closely on the Lockheed T-33. The Defence Department designation of this aircraft is T1A.

March, 1958, two pre-production examples of this well-known liaison aircraft were completed, and another 12 were delivered in the following financial year. By the end of the 1959 fiscal year the GSDF will have 105 L-19s, most of which were supplied some time ago by the Americans.

Many of these were visible at the plant undergoing overhaul and modification, alongside U.S. Army L-19s and L-20 Beavers. With the T-34s and LM-1s, these aircraft are stripped right down and rebuilt, before being test flown by Fuji pilots.

Kawasaki Aircraft Co., Ltd. This company has been associated with the manufacture of aircraft since 1918, and built the largest number of Japanese aircraft in World War II. In six years at Kobe and five at Gifu were built 300 Ki-36 (Ida), 251 Ki-55, 99 Ki-56 (Thalia), 1,391 Ki-45 (Nick) and 215 Ki-102 Otsu, and 52 Ki-55, 20 Ki-56, 334 Ki-36, 320 Ki-45, 1,863 Ki-48 (Lily), 2,722 Ki-61-I (Tony), 374 Ki-61-II and 378 Ki-100, respectively. The company also produced 10,593 aero-engines at Kobe.



At one time, the first prototype of the Fuji T1F2 had extended and rounded wing tips as shown here, but these are not fitted to production aircraft.

It was re-established in its present form in March, 1950, from general engineering interests, to become the second largest aircraft company in Japan, but apart from the design and manufacture of a very limited number of light aircraft in 1953 and 1954, its interests have been concerned entirely with the large-scale licensed production and overhaul of American aircraft and engines. At its Kobe and Gifu facilities, with over 2¼ million sq. ft. of floor space, Kawasaki employs over 6,000 personnel.

Like most of the other companies, Kawasaki began its aircraft activities, in January, 1953, by overhauling at Gifu U.S.A.F. machines, which have included L-5s, L-21s, F-51s, H-13s, T-6s, RF-80s, F-84s, T-33s, F-94s and B-57s. This activity was extended in January, 1955, at Kobe to include jet engines, and J33s, J35s and J47s have been handled for the U.S.A.F. and JASDF at the rate of up to 100 per month. Kawasaki are also expecting to handle the massive J79 turbojet of the Grumman Super Tiger, when it eventually enters Japanese service. An interesting point is that in addition to the Japan area, Kawasaki are responsible for the overhaul of American turbojets throughout the entire Far East, including from U.S.A.F. and local air forces in Nationalist China, the Philippines, Thailand and so on.

In 1953 Kawasaki completed the construction of a new Japanese four-seat light aeroplane, the KAL-1, which was of all-metal structure and had a tailwheel undercarriage. Powered

One of the first post-War designs of the Japanese industry was the 4-seat Kawasaki KAL-1 all-metal lightplane, which was not put into production.

Extensive modification to the Kawasaki KAL-1 in 1954 resulted in the KAT-1 two-seat tandem trainer, in a similar category to the Beech T-34. Only two prototypes were built but are still flying.

by a 260-b.h.p. Lycoming GO-435-C-2 engine, the low-wing KAL-1 made its first flight on July 21, 1953, and two prototypes were completed. The type was subsequently developed into the KAL-2 which was a four/five-seat aircraft with a similar powerplant, but having a cutdown rear fuselage and a nosewheel undercarriage. Two KAL-2s were also built.

The intermediate step to this latter development was the Kawasaki KAT-1, which had a similar general configuration to the KAL-2 except for a tandem cockpit seating two occupants and a lower-powered version of the Lycoming engine. It was intended for military training as a competitor to the T-34, which it closely resembled, but only two prototypes were built. Both these aircraft are still in service with the Japanese civil pilot training school, while of the four KALs, one went to each of the Self Defence Forces, the fourth being kept by Kawasaki for communications flying.

Production of these light aircraft, in which foreign interest is still being shown, and encouraged, was prevented by the Japanese Government agreement with the U.S. in June, 1955, for the production under licence of the Lockheed T-33A jet trainer. Kawasaki was given the task of producing, under the original contract, 97 of these aircraft by June, 1957, beginning with the assembly of knocked-down parts on jigs and tools provided by the Americans.

The Gifu (Nagoya) plant of Kawasaki was tooled up for a capacity of 10 aircraft per month, and manned by more than 2,000 personnel for the T-33 production programme, which was the first large-scale undertaking of this nature in post-War Japan. The first T-33 to be assembled made its initial flight in January, 1956, and production for the JASDF is due to finish this month with the 210th aircraft. Under a cost-sharing programme, the engines, armament, instruments and pyrotechnics, including the ejection seats, have been supplied by the U.S., the Japanese paying for the rest of the airframe.

Kawasaki-built T-33s equip the No. 3 Pilot Training Schools of the JASDF at Tsiuki and Nutavara in Kyushu, where students complete about 120 hr. in six months to qualify for their brevets. The T-33s are also used at two F-86 O.T.U.s, for instrument and other checks.

(To be concluded.)

A Joint Japanese Transport

AT Sugita, on the outskirts of Yokohama, where in days gone by flying-boats of the Imperial Japanese Navy were swung by a massive crane into the waters of Tokyo Bay for their flight tests, a new design by the renascent aircraft industry in Japan was recently revealed. At the moment, this project for a large twin-turboprop transport is visible only in mock-up form. Detailed design, however, by a collective team in which all six major aircraft companies in Japan are represented, is well advanced, and there is intensive liaison with Rolls-Royce in Britain, who are supplying the R.Da.10 powerplants.

The design committee responsible for the production of the YS-11, as the new transport is designated, combines a formidable combination of talent under the leadership of Dr. Hidemasa Kimura, Professor of Aeronautical Engineering at Nippon University. He is the chief designer of the Yusoki Sekkei Kenkyu Kyokai, or Transport Aircraft Design Research Association, which is the present official title of the collective. This was formed in April, 1957, with a number of sub-committees to examine different aspects of design.

In charge of aerodynamics in the YS-11 project is S. Kikuhara of the Shin Meiwa Company. This was formerly the Kawanishi Aircraft Company, for which Mr. Kikuhara designed the Type 2 Emily flying-boat and other naval aircraft. Chairman of the structures sub-committee is J. Horikoshi of Shin Mitsubishi, and as creator of the wartime Zero-Sen fighter, one of the most famous of Japanese designers. From Fuji Heavy Industries—the former Nakajima company—M. Ohta, the designer of the Hayate (Frank) and other fighters, has been loaned as chief of the general project section. Finally, in charge of equipment installation is Mr. T. Doi of Kawasaki Aircraft Industry, and designer of the wartime Hien (Tony) army fighter.

The remaining companies financially involved in the development of the YS-11 are Nippon Hikoki, at whose Yokohama plant the mock-up is located, and Showa Hikoki. All six companies will be represented, to the total tune of 750 million yen (1,000 yen=£1) in a new company to be formed in July for the production of the YS-11—the Nippon Ryokakuki Seizo Kaisha, or Japan Transport Manufacturing Co. Government interest will amount to 2,500 million yen in this company, which is committed to producing four prototype YS-11s by the 1961 financial year.

As the finalized design to be evolved by the committee, the YS-11 represents an attempt to achieve the lowest possible direct operating costs within the confines of particular requirements on internal routes in Japan. The longest of these is the 580 nautical miles between Tokyo and Fukuoka, in Kyushu, and for this and the shorter routes, a capacity of between 60 and 80 passengers was required.

The final priority of take-off and landing performance was determined by the balanced field lengths of the Japanese domestic airports. Of the 21 airfields considered, all but three had runways of 1,200 m. or more in length, and this figure was therefore considered the maximum for governing take-off performance.

For the minimum operating costs, enough power was required merely to meet this requirement and to conform to ICAO engine-out specifications, little consideration being paid, over such short operating sectors, to high cruising speeds. A mean block speed of 200 knots was thought sufficient, as it would still offer something like a 30% improvement over the performance of the DC-4s of Japan Air Lines, which the YS-11 will replace.

Several design studies, employing different engines, were then made on a comparative basis, in the YS (Yusoki Sekkei= Transport Design) series. Because of their unrivalled reliability, Rolls-Royce Darts were an early choice of the committee, who at one time considered installing four R.Da.10s in the YS-11-4 project. Not unnaturally the resultant design bore a fairly close resemblance to the Viscount, but was rejected as being too expensive to operate within the Japanese requirements.

Rolls-Royce R.Da.7s of 2,100 e.h.p. were then considered for a 44-seat version of the design, the smaller YS-30, which would have corresponded fairly closely with the Dart Herald, but was considered to have insufficient capacity. In the YS-21

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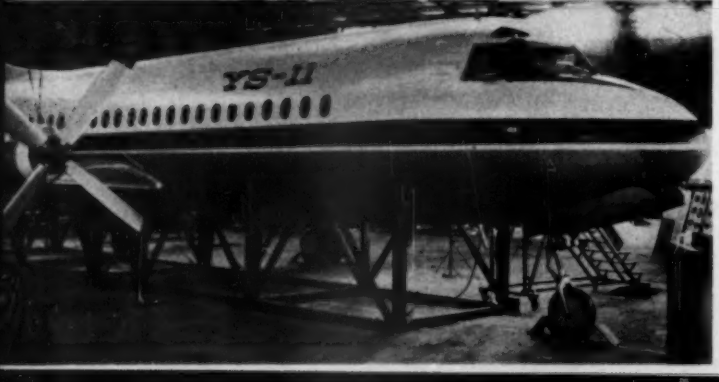

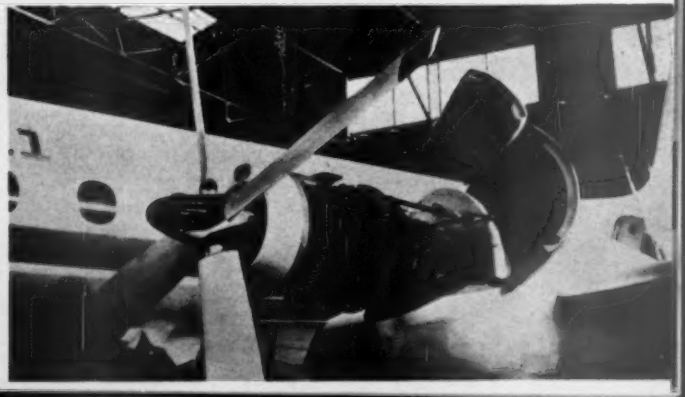

These three views of the YS-11 mock-up at Sugita show the interior layout, the small windows on the starboard fuselage side and the proposed installation of the Vickers/Dart powerplant.

Photographs copyright "The Aeroplane"

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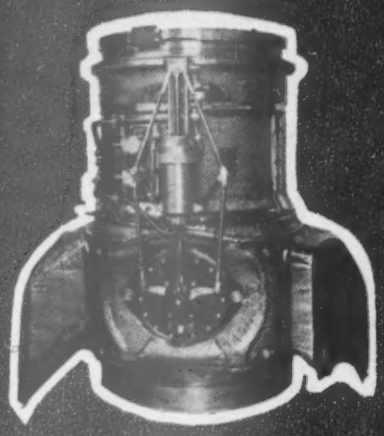

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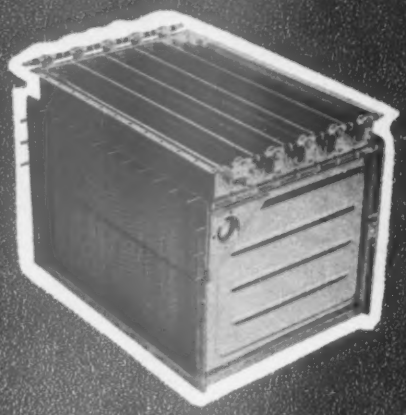

2

3

1 *These thermal blankets are made of refractory fibre cased in .004 inch (.1016 mm) stainless steel. They are made-to-measure and are extremely light, the dimpled construction being responsible for their great strength. Specified for Rolls-Royce and Armstrong Siddeley jet and turbo-prop engines, these particular examples are shown fitted to the Rolls-Royce thrust reverser for the de Havilland Comet.*

2 *We design, manufacture and supply heat exchangers for many purposes in both aluminium alloy and stainless steel. This particular example is for the Vickers Vanguard's anti-icing system. Similar units are being supplied for the Fokker Friendship, the Bristol Britannia, the Armstrong Whitworth Argosy, the Vickers Viscount and the Handley Page Herald.*

3 *High pressure fuel-cooled oil cooler for high performance gas turbine engines. This unit is used in the Armstrong Siddeley Sapphire S.A.7.*

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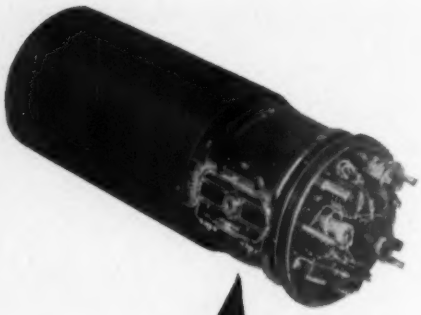

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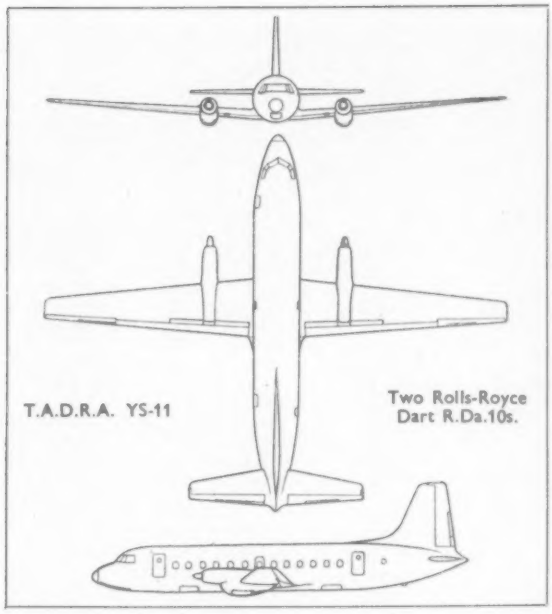


(*Continued from page 284*)

project, of a similar size to the YS-11, the installation of two 3,750-e.h.p. Allison 501D-13 turboprops was proposed but, with a similar Napier Eland-powered variant, apparently offered too much power to meet the required marginal operating costs.

According to Japanese estimates the YS-11, with two 2,660-e.h.p. R.Da.10s, has adequate power to lift up to 60 passengers and baggage over its optimum stage length of 580 nautical miles with direct operating costs calculated on the S.B.A.C. revised method of 1.2d./seat-mile, on a 3,000-hr. annual utilization. This figure is even lower than those quoted for a 62-seat Viscount or the 40-seat Friendship, which are the nearest competitors in direct operating costs to the YS-11.

With such a small power margin for an aircraft of more than 100-ft. span, and nearly 50,000 lb. gross weight, skilful design is needed to ensure the required take-off and landing performance. To increase the static thrust of the Dart engines, these are to be fitted with oversized Rotol four-bladed airscrews. With a diameter of 14 ft., they will be nearly 4 ft. bigger than the airscrews on the Viscount's Dart engines, and will also be larger, for example, than the propellers of the Eland-Convair transport. There is a possibility that the YS-11 airscrews may be further increased by another 6 in., there being ample clearance from the fuselage.

The big wing, and consequent light loading, also contributes to meeting the required take-off and landing performance, which is further assisted by double-slotted flaps extending over a major proportion of the trailing edge and amounting to exactly 20% of the wing area. The high aspect-ratio wing is of laminar-flow section decreasing from 16% t/c ratio at the root to 12% at the tip. Just forward of the flaps, on the upper surface of the wings, are hydraulically actuated lift spoilers. Their purpose is unique in being intended to facilitate increased braking effect during the landing run by destroying a major part of the wing lift, thereby improving wheel adhesion.

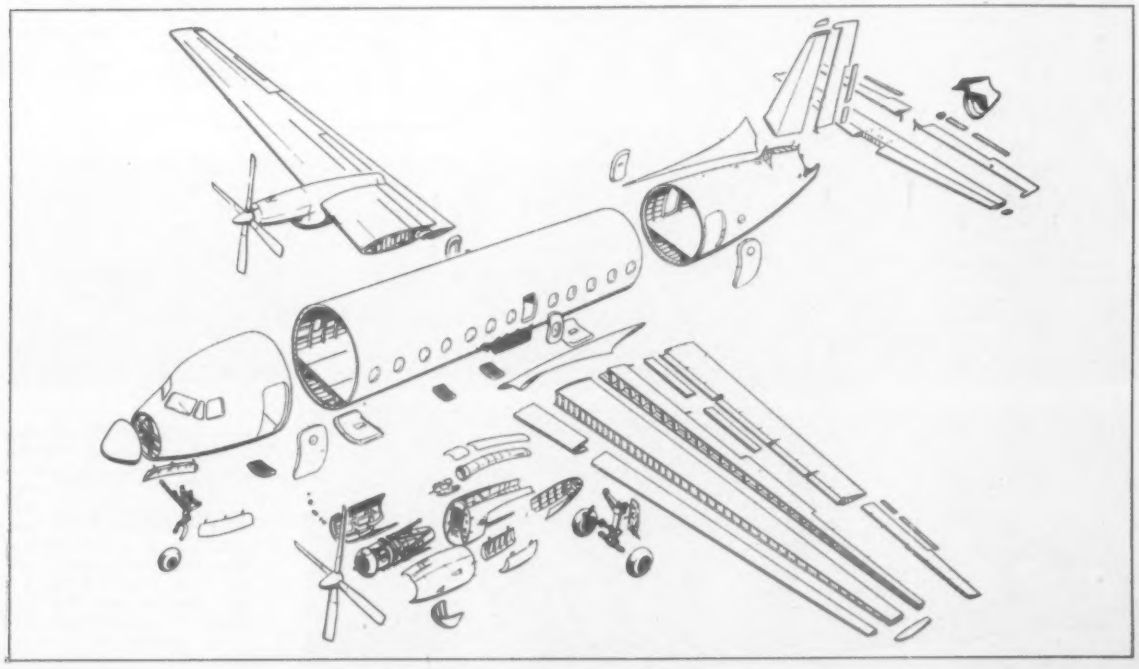
After talking to some of the personnel engaged in the development of the YS-11, the impression is gained that additional means to obtain a really outstanding take-off and landing performance may be under active consideration. Both wind-tunnel and full-scale flight tests are being conducted from Sugita and at Tokyo University with high-lift wings utilizing almost full-span double-slotted flaps in conjunction with spoilers for lateral control, and these experiments are being extended to include flap blowing. With R.Da.10s, however, it is doubtful whether the YS-11 would have a sufficient power margin for the supply of bleed air for flap blowing, if indeed this has been contemplated. It might be possible, however, to install a small gas turbine specifically for this purpose, for a minor weight penalty.

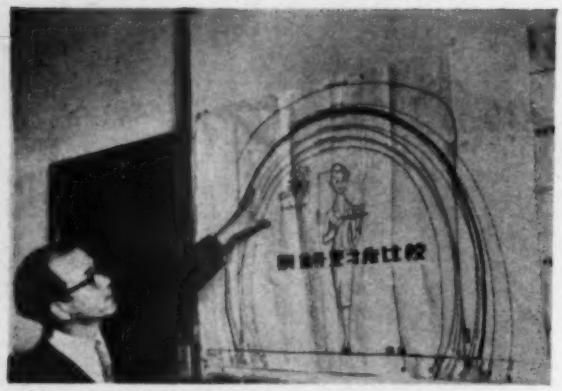
In the wartime low-speed wind-tunnel at Sugita, alongside the old hydrodynamic seaplane-testing trough, research is also continuing with the measurement of hinge moments of control tabs, about which little information is apparently available in Japan. The YS-11 will have all-manual controls, with tab assistance, and is similarly conventional in its structural design.

In the central torsion box of each wing will be a 330-Imp. gal. bag tank inboard of the engine nacelles, and a 440-gal. integral tank in the outer section, giving a maximum fuel capacity of 1,540 gal. For normal operations the use of only the outer tanks is contemplated for operations up to 600 nautical miles.

On the recommendation of Rolls-Royce, and with the agreement of the British company, the YS-11 design incorporates the complete Vickers installation of the Dart power-egg, as in the Viscount, with petal-type cowlings for accessibility. Because of the small diameter of the turboprop units, which exhaust above the wings, there is a necessarily large bulge in each engine nacelle for stowage of the twin-wheeled main undercarriage legs. This is a characteristic of several similar turboprop transports, but in the YS-11 has been given aesthetically pleasing contours.

Initially, the tyres, wheels and brake system for the hydraulically retracting nosewheel undercarriage will be imported, presumably from America, but may later be built in





Mr. M. Ohta, chief of the general project sub-committee of the YS-11 association, and designer of the wartime Frank fighter, indicates to THE AEROPLANE the large fuselage diameter of the Japanese transport in relation to that of other aircraft.

Japan under licence. The flight instruments will also probably be American, to conform with current J.A.L. equipment and servicing facilities, but the British industry has an important claim on the YS-11 with the provision of the powerplants, airscrews and engine instruments. It is probable, too, that the Napier Spraymat system may be used for tail de-icing.

With its resurgent and vigorous industry, Japan is an important potential customer for all types of aircraft accessories. Although the Americans have a firm foot in the door, having provided the entire basis for the post-War Japanese industry, sales prospects remain for a number of British products in this competitive but lucrative market.

The painstaking attention to detail and thorough examination of preliminary data which are typical of the new industry is well illustrated by the YS-11 mock-up at Sugita. Unlike most other mock-ups, this is a full-scale replica of the complete aircraft and is completely furnished, including soundproofing. It also differs in being structurally similar to the YS-11, except that wood replaces metal throughout.

Like the actual aircraft, its construction was a collective effort, which began in August last year following completion of the basic design work, and the authorization of the necessary 50 million yen (about £50,000). It is initially intended for the finalization of the cabin and cockpit layouts, but will later be used for laying out hydraulic and electric systems, and so on.

Access to the cabin is through forward and aft doors in the port side of the fuselage, which is of impressively large size. Its inside diameter of 10.8 ft. is exceeded only by such aircraft as the DC-8, and compares fairly closely with that of the DC-7C. It has the usual underfloor baggage holds, with a total capacity of 286 cu. ft., and is pressurized to maintain a cabin altitude of 6,000 ft. at an aircraft height of 20,000 ft. The YS-11 development programme includes a standard water-tank test for pressurization fatigue.

Metal honeycomb construction is extensively used in the floor and bulkheads of the cabin, which is furnished at the moment with three different types of seat, for 60 passengers. The double row of seats to port are set at 34-in. pitch as will be the case in the 65-passenger layout, and the three-abreast seating to starboard is of the 60-seat type at 38-in. pitch. For evaluation purposes the starboard side of the fuselage has a large number of small windows, which are desirable from the structural point of view, while the port side has half the number of bigger windows more popular with passengers. At the rear of the cabin are twin toilets and a galley.

Crew accommodation is provided for pilot, co-pilot and navigator, in a spacious flight deck, which at the time of our visit was being modified by the addition of extra windows above the front screens and lowering of the coaming for better visibility. The pilots' seats were also being put closer together, at the request of J.A.L. flight personnel. Behind the first pilot is a floor-to-ceiling rack for radio and electronic equipment, while the equivalent space on the starboard side will be available for a small amount of cargo. Flight aids will include VHF, HF, SELCAL, ADF, LORAN, VOR/LOC, weather radar, autopilot, Zero Reader and other equipment.

The main responsibility for assembly and flight development of the prototype YS-11, which is due to fly in mid-1961, will, of course, be in the hands of one of the main Japanese aircraft companies—probably Mitsubishi. Subsequent production is naturally difficult to estimate, but the association is assuming a possible demand for 150 YS-11s within seven years from 1960 at an estimated price of about £350,000 each. Of this total, export orders may account for about 40, while the Japanese National Defence Agency has also shown interest in a military version of the aircraft for transport and airborne early warning.

The Japanese Government was recently informed that no more Curtiss C-46s will be forthcoming under the American aid programme to supplement the current JASDF strength of 36 of these aircraft. Some 16 military transports are at present required, and a freight version of the YS-11 has been proposed, with fewer windows, a reinforced floor and double cargo doors. Pressurization would be retained, but the empty weight would be reduced by some 2,000 lb., the gross weight remaining unchanged. This freighter version of the YS-11 would presumably serve as a basis for the AEW variant, carrying massive search radar in ventral and dorsal blisters.—J.E.F.

Leading Particulars

DIMENSIONS.—Span, 105 ft.; length, 86 ft. 11 in.; height, 29 ft. 2 in.; wing area, 1,021.5 sq. ft.; wheel track, 30 ft. 10 in.

WEIGHTS.—Basic operational, 31,220 lb.; fuel, 6,400 lb.; payload, 11,880 lb.; max. take-off, 49,500 lb.; wing loading, 48.4 lb./sq. ft.; power loading, 9.3 lb./s.h.p.

PERFORMANCE (I.S.A. Standard conditions and 47,400-lb. operating weight).—Cruising speed at 14,200 r.p.m. and 20,000 ft., 280 knots (322 m.p.h.); economical speed at 13,800 r.p.m. and 20,000 ft., 265 knots (305 m.p.h.). Payload-sector distance, allowing 200 n.m. diversion and 45-min. holding at 5,000 ft., at max. gross weight and economical cruise power, 11,905 lb. (60 passengers) over 580 n.m.; 9,920 lb. (50 passengers) over 920 n.m.; and 7,936 lb. (40 passengers) over 1,270 n.m.; initial climb, 1,574 ft./min.; full-power ceiling, 30,500 ft.; ICAO balanced field length, 3,930 ft.

INDONESIAN AID.—These photographs are the first to show Russian aircraft equipment supplied to Indonesia via Czechoslovakia, and making the AURI a jet force of some significance. These Ilyushin Il-28s are taxiing out at Djakarta's Kemajoran airfield.

Alongside some of the Il-28s at Kemajoran are these seven MiG-15 UTI two-seat operational jet trainers, which are used for transition to the more advanced MiG-17s. The pilots appear to be wearing American "bone domes," and the MiGs have the R.A.F.-type ejection-seat warning notices in English below the cockpits.

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Ministry of Defence, September 16, 1958

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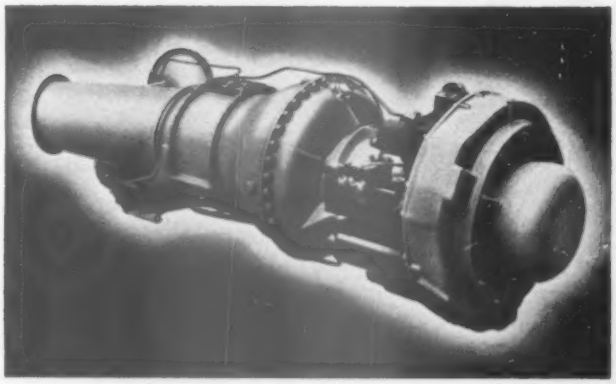

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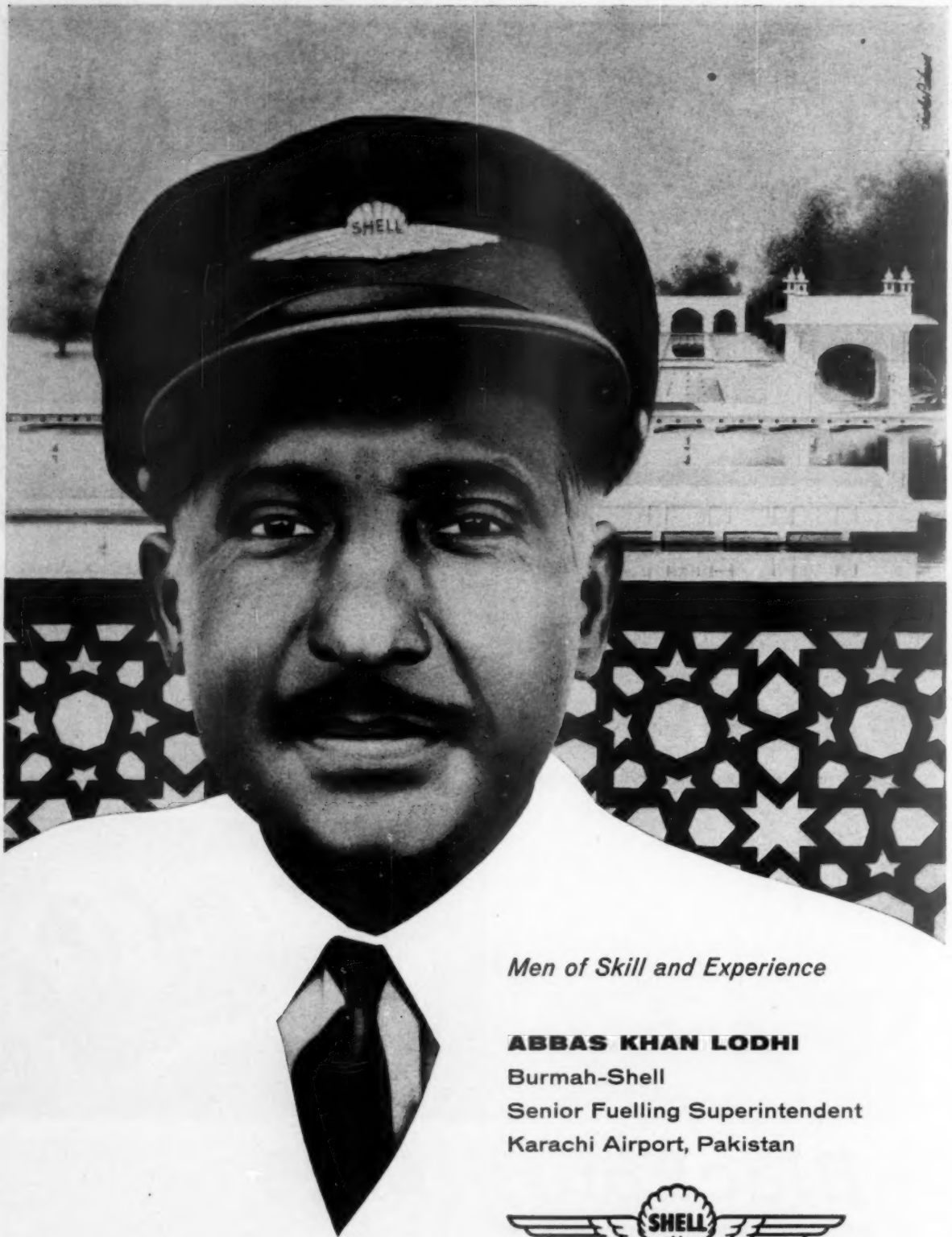

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Book Reviews

CONE OF SILENCE. By David Beaty. 288 pp., 5 in. by 8 in. Secker and Warburg. Price 16s.

FOR the ordinary reader this is a good story in its own right; and for one in the aviation industry it is also satisfying because of its technical excellence. But for the reader in the airline business it may be more than a little heartbreaking where it touches on the raw, as well as fascinating in its descriptions of real men and women and of almost real situations.

Airline men and women will have met the stiffly likeable Capt. Gort and will have experienced, if only at secondhand, variants of many of the situations which are used to lead the events up to the climax—which is also, inevitably, an anti-climax.

The story is told around the early service life of a new turbojet transport, the Atlas Phœnix, which suffers two take-off accidents at a near-tropical airport in the hands of Capt. Gort, who, in keeping with his character and his way of life, flies, rigidly and with disciplined perfection, "to the book." Most of the other fleet captains, sensing, as pilots, a take-off peculiarity, had been keeping the nosewheel down for a little longer and surreptitiously adding a few knots to the flight-manual unstick speeds.

The reader is taken unhappily through the agonies of a public inquiry in which counsel representing the manufacturers, well briefed and experienced, makes the pilot appear to be both clumsy and incompetent while his attempted explanations are brushed aside. This discomfort is forgotten when the censured senior captain is given a flight check—and the description of instrument pattern-flying on radio-range signals is one of the best things in the book.

But, of course, the author knows what it is all about. He understands what it feels like to be sitting in a crew-rest seat during a critical take-off—and to be up in the left seat waiting for unstick speed to be called by the first officer.

Maybe it is not, at short-term, a very good thing for the general reader, a prospective air traveller, to be given this kind of astringent medicine—but it will, in the end, do more good than harm.

Mr. Beaty has offered a pretty fair picture of the more difficult flying and operating side of the business—a side which is normally, and very luckily, hidden from the so-called man-in-the-street. The title of the book is mildly ingenious in its double meaning.—H.A.T.

A HISTORY OF THE UNITED STATES AIR FORCE, 1907-57. Edited by Alfred Goldberg. 277 pp., 8 in. by 11¼ in. Illustrated. D. Van Nostrand Co. Price 51s.

STRETCHING the facts a little, the U.S.A.F. can claim a longer history than any other air force in the World; but it has existed as an independent Service only since September 18, 1947. On that date the U.S. armed services were "unified" by the strange process of creating a third Service where there had previously been only two, and the principal aim of this splendid book is to record the U.S.A.F.'s organization and achievements over the past decade.

As a result, the 32-year period up to the start of the Second World War is covered in only 45 pages, followed by 52 pages on the War years. But they are very large pages, made up of tens of thousands of words and 180 illustrations, so that even these sections of the narrative could hardly be described as sketchy. In fact, it is unlikely that any incident, type of aircraft or personality of significance has been overlooked, and the historically minded reader will probably give up the game of trying to find omissions after the first 10 minutes. As for the last 17 chapters, suffice it to say that they even include pictures of stranded Moslem pilgrims being helped on their way to Mecca by the magic carpet of MATS, a parade of fearsome-looking sentry dogs at a SAC base and Medical Service surgeons dealing with an airman's appendix.

The British reader will squirm occasionally when he reads remarks like "the B-17 was the outstanding bombardment plane in the world from the time of its emergence until the B-29 appeared," and it is a little unfair to complain because the Allies refused to allow U.S. observers to study their air forces in action in France in 1914-17. America was not then in the War, and the R.A.F. was to learn the mistake of telling non-combatants too much a generation later, when U.S. newspapers published details of the Tornado, Stirling and other still-secret British military aircraft in the autumn of 1940.

In general, however, this history is readable, accurate and frank, and biased only by the necessity of concentrating on the work of a single Service in campaigns that involved many allies. Its quality stems from the fact that it was written by historians from the Washington and Air University offices of the U.S.A.F. Historical Division. Their former colleagues have shown already in the seven-volume history of "The Army Air Forces in World War II" that, in the well-remembered words of C. G. Grey, "although the matter of history may be dry, the telling of it need not be wet."

Once again in this book there is no "Wild blue yonder" stuff. In fact, there is not even an attempt to depict Billy Mitchell, the demi-god of U.S. air power, as anything but the impetuous and insubordinate officer that he was. Whilst emphasizing the basic common sense of his doctrines, the authors leave no doubt that his methods of putting them over fully justified his court-martial.

It is good to learn from the preface of this book that the U.S.A.F. Historical Division has in preparation a history of the U.S. Army air arm for the period 1861-1939. But whatever books may be published in future they will not lessen the value of this present history, which gives a concise record of the concept and development of the World's mightiest air force and illustrates it with a collection of pictures that are worth 51s. by themselves.—J.W.R.T.

WHITES AIR DIRECTORY AND WHO'S WHO IN NEW ZEALAND, 1958-59. Managing editor, Leo L. White. Compiled by N. E. Smith. 152 pp., 5½ in. by 7½ in. Whites Aviation Publications. Auckland. Price 10s. 6d.

LIKE its many predecessors, the new edition of "Whites" contains pages crammed with useful reference material. Twenty-two pages are devoted to the "Who's Who" section; the R.N.Z.A.F. organization is explained, and scheduled and non-scheduled civil operators are listed, along with details of routes, personnel and aircraft. Aerial work operators, aerodromes, clubs, and so on, are all listed, and there is every reason for assuming that this work will continue for many years as the standard aeronautical reference book in New Zealand.

It may be said that in general this reference work is to New Zealand what "THE AEROPLANE Directory" is to the Commonwealth.—H.J.C.

AVIATION PSYCHOLOGY IN WESTERN EUROPE— and a report on studies of pilot proficiency measurement. Papers collected by J. B. Parry and S. D. Fokkema. 64 pp., 6 in. by 9½ in. Swets and Zeitlinger, Amsterdam. Price 15s.

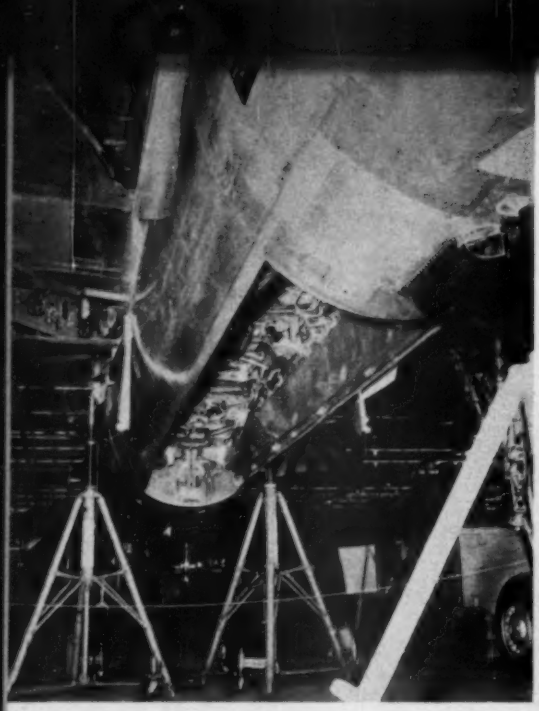
THIS is the first publication from the Western European Association for Aviation Psychology, which was founded towards the end of 1956. It is designed primarily as a means of disseminating internationally some of the experience of, and methods used in, the study of pilot psychology and proficiency testing methods.

Following the explanatory introductions, there are 12 reports, mainly from European air forces and airlines, including a two-part study of R.A.F. methods and an outline of those used by the U.S. Air Force Personnel and Training Research Centre and its predecessor.

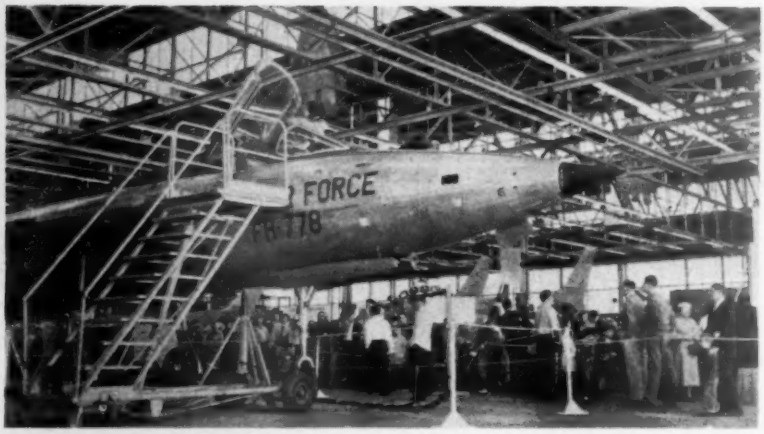
"Now, that's what I call a fully reclining seat!"

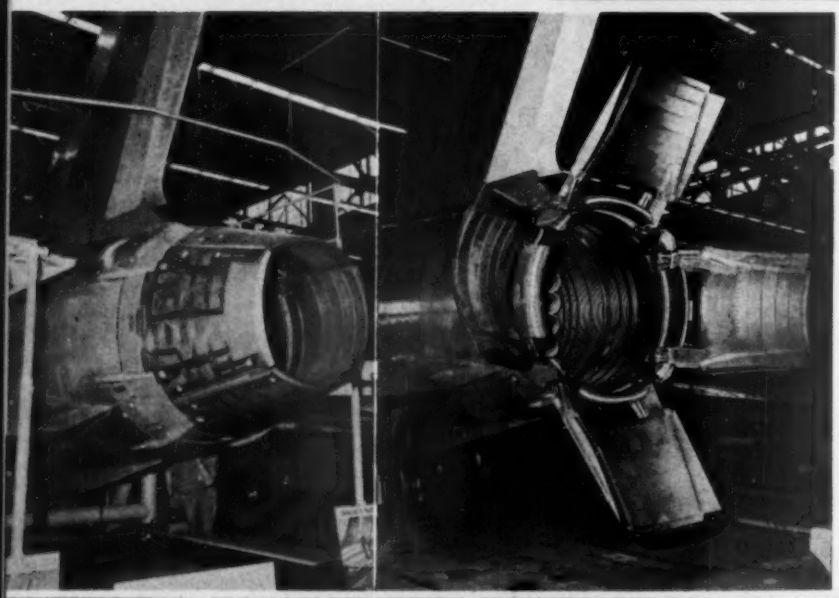
Open House at Republic

Levy-Shipp photographs



The main feature of the open day held recently at the Republic Aircraft Corporation's Farmingdale plant was the F-105B Thunderchief fighter-bomber. Above is seen its internal missile bay.

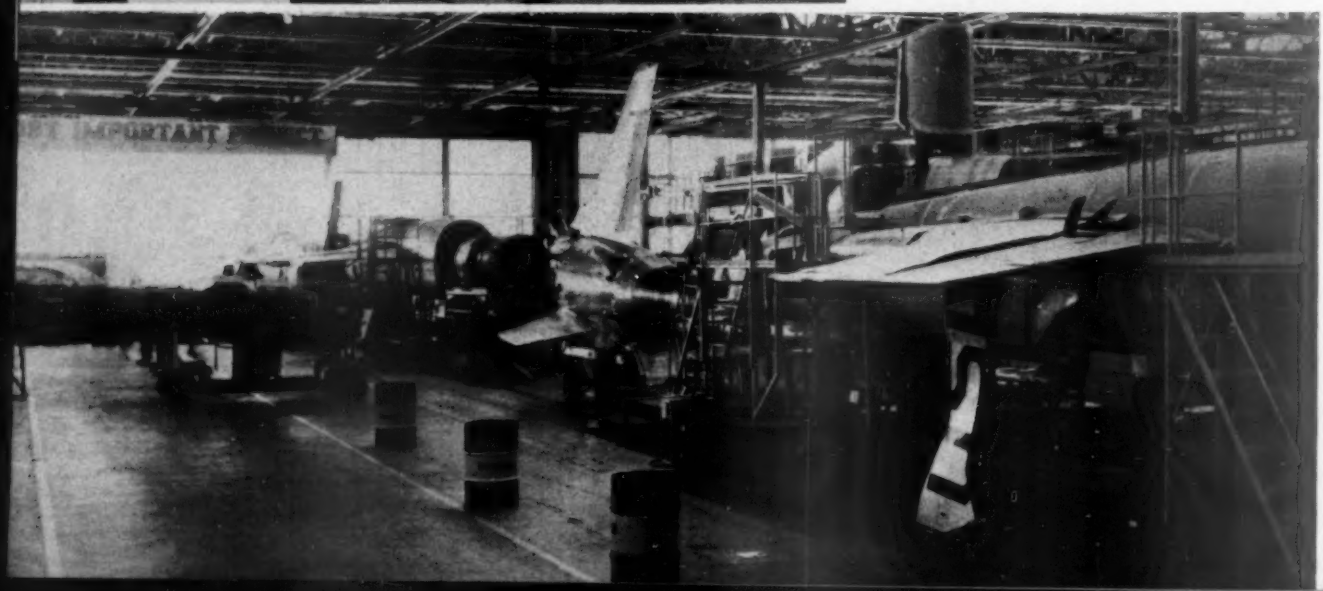




The F-105B has a 15,000-lb. Pratt & Whitney J75 turbojet. It is 63 ft. 1 in. long, has a span of 34 ft. 11 in., and a height of 19 ft. 8 in.

On the left are seen the "clover-leaf" air brakes which form the last 36 in. of the fuselage. The brakes are in the cruise position (left), and in the slow-flight position.

Final assembly of the Area-ruled Thunderchief is seen below. Many features of the aircraft and of its constructional methods were shown to the public for the first time. The Thunderchief can be refuelled in flight at very high speeds and great heights and it has global range.



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LUCAS

(*Continued from page 273*)

DISCOVERER SATELLITE. — On February 28 the first Discoverer satellite was launched into a polar orbit from Vandenberg A.F.B., Calif. Its radio equipment is faulty and only sporadic signals have been received from the satellite, which was launched by a two-stage vehicle—a Thor IRBM with a second stage built by Lockheed. This is the first U.S. satellite to be launched from Vandenberg; previous launchings were at Cape Canaveral.

OMEGA SALES.—The Omega Aircraft Corpn., of New Bedford, Mass., has announced that its first six production BS-12 Universal Flying Crane helicopters have been ordered by various U.S. companies, including one by Umbaugh Aircraft, Ocala, Fla., for agricultural experiments. A further four aircraft are being built, one of which will be used as a demonstrator. The prototype is now undergoing C.A.A. tests. All will have 260-h.p. Lycoming 540-series turbines. The production aircraft is priced at about $75,000.

NEWLY POWERED.—This Auster Autocar, VH-ADY, has been fitted with a 225-h.p. Continental O-470 engine and equipped with a hopper and dispenser for the dropping of superphosphates. The loaded weight is 2,640 lb.

CARAVELLE DE-ICING.—In our January 16 issue we recorded that Napiers are testing the Caravelle's wing and tail unit de-icing system. In saying that the aircraft has the Napier Spraymat system, however, we were not correct; the Caravelle is de-iced by a hot-air system.

CARGO CONVAIR.—A version of the Convair 600 jet transport designed for civil or military freight operations has a hinged rear fuselage. The entire tail unit hinges sideways to facilitate loading of freight into the cabin, the floor of which is at truck-bed height.

S.E.3200 TESTS.—The first ground tests of the S.E.3200 18-passenger commercial or military helicopter were made at Le Bourget on February 6.

Commercial Aviation Affairs

EXCHANGE NEWS.—Fourteen Airspeed Ambassadors (part of the original B.E.A. fleet) are now on offer through Aircraft Exchange, according to the eighth *Market Report*. Price asked is $210,000 each, with zero time on the airframes since overhaul; they are also available on lease. Aircraft Exchange reports that it now has close to 200 members, and claims that its member-airlines own "55% of the free world's transport aircraft."

COMET NEWS. — De Havilland delivered the eighth Comet 4 to B.O.A.C. on February 24, two months ahead of contract. This was G-APDA, the first production Comet 4, which has undergone complete overhaul and modernization since it was used for B.O.A.C. proving flights. The seventh Comet 4, which was the third from the Chester production line, was delivered on February 12. B.O.A.C. have now logged over 3,500 hours with the Comet 4.

ARGENTINE DELIVERY.—The first Comet 4 for Aerolineas Argentinas was handed over at Hatfield on February 27 and was to leave on delivery to Buenos Aires on March 2.

S.A.S. AND PRESTWICK.—S.A.S. will use Prestwick for at least one daily DC-8 service on the North Atlantic next year.

AN ATC CABLE.—A new trans-atlantic cable between Newfoundland and Scotland is expected to be in service by 1962 with the portion between Scotland and Iceland ready a year earlier. This cable is primarily designed to improve ATC communications across the North Atlantic, and will provide one speech channel and four duplex teletype-write channels. Its cost will be shared by Canada, the U.K. and other countries whose airlines make use of the facilities.

DECEMBER MOVEMENTS.—Air transport movements at U.K. aerodromes in December, 1958, decreased by 1.6% compared with December, 1957—probably as a result of the widespread fog. Movements during the whole of 1958 increased by 3.4% passenger traffic by 1.7%, and freight traffic by 20.5%.

CATHAY PACIFIC CONTINUES.—The new operating company formed jointly by B.O.A.C. and Cathay Pacific Airways (see THE AEROPLANE for January 2, 1959) will start operations on or about July 1. From that date Cathay Pacific Airways—which continues to be the operating name—will extend its services to cover all the routes previously operated by Hong Kong Airways.

LEOPOLDVILLE AIRPORT. — On February 16 the new N'djili airport came into use at Leopoldville, Belgian Congo. All Sabena services, both international and domestic, now use this airport in place of N'dolo. N'djili has been constructed to cater for jet services from 1960 onwards and has a 15,400-ft. runway.

ANTARCTIC WEATHER.—An international weather centre in Melbourne will analyse all information from the Antarctic and issue charts covering a large part of the Southern hemisphere. The service, in which scientists from 13 nations, including Russia, are collaborating, will be of considerable assistance to airlines planning transpolar and Antarctic operations.

SOUTH AFRICAN COACH. — On March 25 South African Airways will introduce coach-class service on certain domestic routes, using 66-seat DC-4s. Fares will be reduced by a third to a quarter. Only light refreshments will be served, and no liquor will be sold in flight.

T.A.A. FLUORESCENCE.—All Trans-Australia Airlines aircraft are to carry markings in luminescent orange paint to make them more easily visible.

CAR FERRY TRAFFIC.—During 1958, car ferry traffic on the shorter routes between England and France by both air and sea increased by 21% to 223,073 cars. Silver City Airways increased their share of this total to 20%, representing a 57% increase over their traffic in 1957.

HURN TERMINAL.—A new terminal building is to be provided by the M.T.C.A. at Bournemouth Airport, Hurn, by 1961. This is part of a Ministry plan to concentrate operations at Hurn and to withdraw from Southampton Airport, Eastleigh.

SABENA RESULTS.—Largely as a result of the Brussels World Exhibition, Sabena's traffic in 1958 showed an increase of 16.7% in ton miles and 39.1% in passengers carried. The Sabena helicopter network carried 117,858 passengers, including 54,682 making sightseeing trips over the exhibition.

PAN AMERICAN PLANS. — Beginning on April 26, Pan American Airways will provide two daily Boeing 707 services between London and New York, and from June 1 frequency of the New York-Paris service will be increased to 11 a week. As at present, all jet services will offer de luxe and economy class travel. First-class and economy class will be provided on piston-engined services and tourist class will be eliminated completely.

FIRST EXPORT.—Scheduled for delivery soon and service later this year, the first Boeing 707-138 for Qantas (left) will also be the first of these jet transports exported. It was the 29th 707 to be rolled out at the Renton factory, and is the first of a fleet of seven for Qantas.

News About People

ELECTRONICS CHAIRMAN.—Mr. L. T. Hinton, B.Sc., M.I.E.E. (Standard Telephones and Cables, Ltd.), has been elected chairman of the Electronic Engineering Association in succession to Mr. F. S. Mockford (Marconi's Wireless Telegraph Co., Ltd.). Mr. R. C. C. Rankin, O.B.E., of Mullard, Ltd., has been elected vice-chairman.

SARO TEST PILOT.—As forecast in THE AEROPLANE of December 12, 1958, Lieut. Cdr. P. M. Lamb, D.S.C., A.F.C., has been appointed chief test pilot (fixed-wing aircraft) of Saunders-Roe, Ltd. He joined the Fleet Air Arm in 1941 and was trained in the U.S.A. He served with Nos. 807 and 800 Sqns., and in 1951

Lieut. Cdr. P. M. Lamb, D.S.C., A.F.C.

took the E.T.P.S. course, subsequently being appointed to the Naval Test Sqn. at Boscombe Down. From 1955 to 1957 he commanded No. 810 Sqn., and commanded No. 700 Sqn. the next year. He gained his D.S.C. in 1950, for operations in Korea, and a bar to it during the Suez affair. He has flown 3,000 hr. on 75 types and made round about 700 deck landings.

BROUGH VISIT. — A R.C.A.F. team led by Sqn. Ldr. T. R. Futer (right) visited Blackburn Aircraft recently to study the NA.39 strike aircraft. He is seen here with Mr. T. Bancroft, production director, and another member of the team.

CONTROLS APPOINTMENT.—Mr. W. H. Haydon-Soutar, A.M.I.Mech.E., A.F.R.Ae.S., has been appointed chief engineer of Aero Controls, Ltd., of Northampton. He has been previously with Hawker Aircraft, Hunting Aircraft, Flight Refuelling, Edgar Percival Aircraft, S.P.E., and Brooklands Aviation.

FOR RADIO SERVICES.—Mr. Eric K. Cole, C.B.E., is to be elected an honorary member of the British Institution of Radio Engineers "in recognition of his services to the radio and electronics industry and profession." He is chairmain and managing director of the Ekco concern, of Southend-on-Sea, which he founded in 1926.

TECHNICAL PUBLICITY. — Mr. A. M. Atton, A.M.I.E.E., recently chief engineer of Davalls, of Greenford, and at one time with Vickers-Armstrongs (Aircraft), Ltd., at Weybridge, and Mr. H. M. Atton, B.Sc., have formed Atton Developments (Woking), Ltd. This company will be concerned with producing technical publications and publicity for small engineering firms employing up to 300-400 men, including maintenance and overhaul manuals to the S.B.A.C.'s interpretation of the U.S. Air Transport Association's specification No. 100. The address of the company is 49-50 Maybury Road, Woking, Surrey. (Tel. Woking 4928.)

ROBERT NOORDUYN.—We regret to record that Mr. R. B. C. Noorduyn, designer of the well-known Norseman and other aircraft, has died at Burlington, Vermont. He was 65.

A. R. WEYL.—With regret we record that Mr. Alfred Oscar Weyl, designer of the Dart Kitten, and a pilot with the German Air Force in the First World War, died on February 23.

Military Aviation Affairs

SIDEWINDERS IN SWEDEN.—Chosen as standard armament for Swedish fighters, including the supersonic Saab Draken and the two-seat Lansen, the Sidewinder infra-red air-to-air missile is on order from America. Two or four can be carried by the Draken—this is a two-missile installation.

EUROPEAN SIDEWINDERS. — Reports state that the recent contract signed by the Swedish Government to buy Sidewinder AAMs, may prompt Switzerland to make a similar purchase for her air force. According to American military officials in Washington, Swiss military missions have visited the U.S. to study missiles, including Sidewinders.

DELTA DART IN SERVICE.—The U.S.A.F. has announced that the Convair F-106 Delta Dart interceptor will be in service by late spring or early summer. The first three squadrons will be based at McGuire A.F.B., New Jersey; Geiger A.F.B., Washington and Andrews A.F.B.

SWEDISH RE-EQUIPMENT.—With the replacement of the piston-engined Saab-18 by the Saab-32 Lansen for reconnaissance duties, the Swedish Air Force's combat aircraft are now 100% jets. Over the past 12 years nearly 2,000 jet aircraft have been supplied to S.A.F. and the J-35 Draken will be going into service during this year.

AIR OFFICER, WALES.—The C.O., R.A.F. St. Athan, is in future to undertake the R.A.F. ceremonial and social duties in Wales previously the responsibility of the A.O.C., No. 64 (Northern) Group. For this purpose the station commander will have the title "Air Officer, Wales." No. 64 Group is to be disbanded on March 24, and the A.O.C., Air Vice-Marshal H. V. Satterley, is retiring from the Service.

ASTRAL ASPIRANTS.—Latest version of the Lockheed Starfighter, the present holder of the World records for speed and altitude, is the F-104C, which is now in service with Tactical Air Command. In this capacity the F-104 is capable of carrying nuclear weapons.

Future Prospects for Spaceflight

ANY lecture on the scientific and industrial aspects of spaceflight is likely to attract questions on the subject of Britain's participation. This proved to be the case on February 20 at the Woolwich Polytechnic when Mr. J. E. Allen, of the Weapons Research Division of A. V. Roe, gave a talk on "Spaceflight, now and in the Future."

With many slides and models Mr. Allen described some highlights of aerodynamics, propulsion and guidance techniques for aircraft, missiles and satellites. The many airflow facilities now available for hypersonic flows were shown, such as the shock-tube, the hyper-ballistic range and the electric-arc-driven tunnel.

Particular attention was paid to the Atlas ICBM and the military requirements which had led to it. The availability of the ICBM both in Russia and the United States have, said Mr. Allen, given spaceflight an unexpected impetus. He discounted the concept of the "Ultimate Weapon," in the light of more recent developments such as Polaris and Bold Orions, which were much smaller than the ICBM and thus likely to be of less value for space flight. The lecturer then described the tasks that Atlas might accomplish as a satellite launcher, including SCORE, the "Mercury" manned capsule, and the Convair-Avco proposal for a four-man satellite station, equipped with two re-entry gliders.

For the immediate technical future it was clear that the design and operation of orbital vehicles would be important in the next 10 years. At present, considerable and expensive research was involved; but the problems would yield gradually, permitting future design to be less expensive and more certain. There would be a very wide range of duties to be performed by orbital vehicles and many vehicles having markedly individual designs—and size—would be needed.

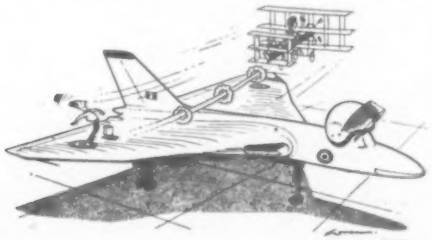
Britain had always made good theoretical contributions to spaceflight and our shortcomings, in relation to the U.S.A. or the U.S.S.R., were in the realm of hardware. We should feel proud of our efforts in the field of, for example, satellite tracking and observation, aerodynamic theory, and the measurement and interpretation of the physical characteristics of the upper air. What seemed to be needed for a hardware contribution (if there was to be one) was money and industrial effort, and above all, a definite plan setting out the country's objectives.

Avro Club's Eighth Dinner

Left to right, Air Chief Marshal Sir Francis Fogarty, Mr. Phillip Hall, winner of the 1959 Avro 504 Club Trophy, Mr. Joe Taylor, Mr. Geoffrey Verdon-Roe and Sir Roy Dobson.

AMONG the annual functions which this writer finds especially enjoyable none rates higher than the Avro 504 Club's dinner at Londonderry House. Of the eight dinners to date, SIR ROY DOBSON, managing director of the Hawker Siddeley Group, has missed but one, when he was abroad, and on February 20 he led the revels with his usual gusto.

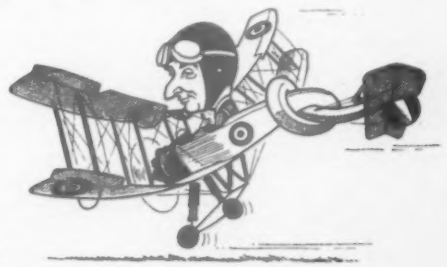
The evening's chief guest, AIR CHIEF MARSHAL SIR FRANCIS "JOE" FOGARTY (present, he suggested, on the "You make 'em, we break 'em" principle) recalled the gay '20s and '30s and the fun and good flying provided by the 504. "Dobbie," a 504 pilot himself in a civil way, spoke of Blackpool week-ends with Joe and other Service aircrew who managed to arrive late on a Friday to take delivery of a lovely new aeroplane. Remembered, too, were "Tedder's Academy" and "Reggie" (now Air Marshal Sir Harold) Lydford, who partnered Joe in the memorable crazy flying act with two 504s in the early R.A.F. Hendon Pageants and who asked Dobbie to fit one with a tail-wheel to facilitate landing backwards off a tail-slide.



Another guest, the late SIR ALLIOTT VERDON-ROE's son GEOFFREY, who inherits his father's interest and delight in aviation, was made an honorary life member of the club, and PHILLIP HALL, best of 800 Avro apprentices in 1958, was presented with the 504 Club trophy when he joined the six other fine young men who had been inducted as members at previous dinners. He acknowledged the honour in an excellent speech.

Toasts were proposed by two of the old Avro men—TOM PRINCE, who recalled that he first saw "A.V." in a cycle race more than sixty years ago, and BOB SHIPPERBOTTOM, who voiced everybody's gratitude to Sir Roy and Avro for putting on the dinner, and our appreciation of the work of Joe Taylor, an Avro apprentice and pilot before he joined Shell-Mex-BP, and John Gray, Avro's publicity manager, for organizing the evening so well. Guests included Air Cdre. G. J. C. Paul, the active secretary of the Air League, and J. H. Bruce, the aviation historian, who is preparing a book on the 504.

Air-BP presented a copy of J. W. R. Taylor's "C.F.S., Birthplace of Air Power," to each member, and the old and young and the in-betweens talked and joked far into the night about fifty years of aviation in general and A. V. Roe in particular.—WREN.



"The gay '30s."

Private Flying

H.J.C.'s CLUB COMMENTARY

● RECENTLY formed is the **British Skydivers Club**, a group of parachutists keen to raise the standard of the sport in this country. The committee consists of Messrs. N. Hoffman, J. McLoughlin, D. Lee and M. McArdle, and the secretary is Mrs. M. Hoffman.

The Skydivers operate from Thruxton aerodrome and use the Tiger Moths of the Wiltshire School of Flying. They have been engaged in parachuting for some months. Three of the team—which has a combined total of more than 1,500 descents—have represented Great Britain in international competitions.

● AT the **Elstree Flying Club** the newly elected committee consists of Dr. R. G. Atherstone, J. Duer, J. Finding, D. Grob, P. Heywood and P. Laffy; permanent co-options are Miss M. Ager, E. Wild (C.F.I.) and D. F. Ogilvy (manager).

On March 11 a students' night is to be held at the club, and a spring party is fixed for April 11.

● TO PROVIDE money to train young Malayans to fly, the **Kuala Lumpur Flying Club** is asking the Malayan Government for help. The club president, Mr. R. L. Akers, has said that most of the grant of (Malayan) $13,330 received in February, 1958, has been spent. This sum was the club's share of $40,000 subscribed to a war fund 18 years ago and was distributed between Malaya's four flying clubs (THE AEROPLANE, June 6, 1958).

The club is to suggest that the Government pays $2,000 for each pilot trained up to P.P.L. standard, plus $150 a month as a subsidy for flying experience. At present there are no Malayan instructors, and the club hopes to train some.

Photographs copyright "The Aeroplane"

INSIDE AND OUT.—Members of the Surrey and Kent Flying Club (formerly the Surrey Flying Club) are seen here in their new headquarters at Biggin Hill aerodrome. The C.F.I., Mr. Peter Chinn, is fourth from the right. The lower picture shows the exterior of the clubhouse and the hangar.

Gliding Notes

by Dr. A. E. Slater

REGULATIONS for this year's National Championships, to be held from May 9 to 18 at Lasham, have been issued, and are much the same as before, with competitors divided into two leagues and two-seaters flying on equal terms with single-seaters. But this time only the League 2 entrants will have their worst day's points discarded; for League 1, every day's points will count, however many contest days there are.

This discarding of the worst day is popular among many pilots who are apt to have one bad day during a contest, but it does penalize consistency; and it was consistently good flying which enabled Paul MacCready and Ernst-Günther Haase to become World Champions in 1956 and 1958 respectively.

There are also different definitions of a "championship day" for the two leagues: in League 1, 50% of those still in the contest must score marks; in League 2, 20%. In distance and goal flights the first 20 miles do not score; the goal bonus is 30%. In races, marks are also given for distance, and speed marks are in proportion to the square of the speed.

For distance along a set line, those who land off course will have their distance from the line subtracted from their projected distance along it, before being marked; I believe this subtraction was first introduced by the Midland Club at one of their annual Easter Rallies.

The tasks for the two leagues may be different; those for League 1 will provide training for World Championship performances.

* * *

Another B.G.A. announcement is a new Operational Regulation for clubs: "No glider shall enter cloud within five miles of a gliding site except from at least 200 ft. below the lowest part of the cloud." This regulation is evidently the result of an incident last year when a single-seater and a two-seater collided inside a cloud, and all three occupants got away safely; it appears that one of them had entered the cloud from its side.

The news reached us at the beginning of the World Championships at Leszno, and in view of what happened—or nearly happened—there, a supplementary regulation might well be promulgated asking pilots to leave a cloud through its side and not by spinning down again to the base.

* * *

WITH the holding of Cambridge University Gliding Club's annual dinner in the Hall of Peterhouse, the oldest college in the University (founded 1284), the club has attained the pinnacle of respectability. This was due to the efforts of the club president, John Pringle, who is Fellow of the college, in persuading his fellow-Fellows to consent, and it is hoped they will consent again in future. (They were not there to hear the speeches from the High Table.)

The presentation of annual trophies and prizes was simplified for the president by the fact that Peter Neilson won four of them. Three were awarded for the same flight, an out-and-return of 165 miles in 6¼ hr., in the course of which he passed over Oxford. This got him the prize for the fastest flight of the past year between Oxford and Cambridge, the Pringle Pot for duration, and the Machin Pot for out-and-return (it is inscribed "for going nowhere by the most devious route"); he also reached the highest rung on the "president's ladder," which measures all-round performance by a complicated mathematical formula.

The Brunt Trophy, for the greatest height by an undergraduate of any British university gliding club, went to Cambridge as usual, though only provisionally, for a climb of 2,800 ft. over Crossfell by Peter Bulman. Although this trophy has been going for 10 years or more, there is still only one other club, Imperial College, in the running for it.

Three new trophies were offered. Mr. Edwards, who has two gliding sons in the club, presented his to John Griffiths for being the highest undergraduate on the president's ladder. Mr. Menkevich, an American member, found no one to qualify for his trophy by making a goal flight on a first cross-country. And the Pons Pot, offered by the Alexander family for the longest distance, went to John Hulme for 168 miles to Sturminster Newton in Dorset.

The Pons, now defunct at last, was the second aircraft the club ever had. The first was a nacelled Zögling which began flying in April, 1935. The club is therefore one year short of its silver jubilee.

Correspondence

Canadian History

THE RCAF Station Aylmer Stamp Club is preparing a historical display of Canadian airmail envelopes, photographs of aircraft, photographs and autographs of pilots connected with these flights and other data in commemoration of the 50th Anniversary of Flight in Canada and the 35th Anniversary of the RCAF.

May our club have the opportunity to present this information to your readers in anticipation of obtaining material for our display which will be shown at Sarnia, Ontario, in May, at the Annual Canadian Philatelic Society's Exhibition, at RCAF Station Aylmer on Air Force Day in June, and at other appropriate locations?

RICHARD K. MALOTT.
Flight Lieutenant,
(RCAF Station Aylmer Stamp Club.)
RCAF Station, President, Aylmer, Ont.

Firm Friendship

YOUR correspondent, Mr. H. A. Taylor, refers to the good behaviour of the Friendship under stall conditions. "There was," he writes (THE AEROPLANE, January 30, p. 123), "a very adequate buffet warning (so much so that one hated to think about the rivets in the tailplane)."

Travellers in this aircraft, and pilots too, we hope, will be reassured to know that the main structure of the Friendship tailplane is, in fact, *bonded* with Redux.

K. S. MEAKIN.
(Publicity Manager, CIBA (A.R.L.), Ltd.).
Duxford, Cambs.

Canadian Junkers (and others too)

HAVING read with considerable interest the various letters by Messrs. Shackleton, Cannon, Zuerl and Kent relating to the original (single-engined) version of the Ju 52 series (THE AEROPLANE for May 30, November 21, 1958, January 9, January 23), the following additional information on Junkers transports in Canada will, I hope, be of special interest to Mr. J. A. Kent. And I should also like to take the liberty of commenting on the letter of your distinguished correspondent, Mr. Walter Zuerl!

As stated by Mr. Kent, only one single-engined Ju 52 was purchased by Canadian Airways, Ltd., back in 1931. A Canadian Airways photograph shows this same Ju 52 with the two big wooden airscrews (as described by Mr. Kent), the engine cover down to ground level, complete with oil-burning stove for "warming up."

Undoubtedly, Junkers transports in those years were much favoured by Canadian operators because between 1933-36 seven Junkers W-34s were imported. Even as early as 1921 two Junkers F-13s were bought by the Imperial Oil Co. of Canada who used them for many years, flying mainly between Edmonton (Alberta) and the "boom town" of Norman in the N.W. Territory, following the discovery of crude oil in that area of the vast Dominion.

Of the seven W-34s which went to Canada, three are still very much in active service! They are owned and operated by Pacific-Western Airlines of Vancouver, B.C. An excellent brief report of the amazing careers of these three veteran German transports can be found in *Esso Air World*, Vol. 8, Issue No. 3 (page 84) with a fine colour photo of one of the trio—CF-AQW—on the cover page of that journal.

Mr. Zuerl's claim that the prototype Ju 52 was fitted with an A.S. Leopard powerplant (British designed) is indeed a most enlightening piece of information, especially for those of us who were not previously aware of this little-publicized fact re the original (single-engined) Ju 52. I had always been under the impression that the powerplant used on the Ju 52s, the single-engined version of course, were usually Junkers-built L.88s developing 800 h.p.

I believe that at least two or three books have been published in Germany, at least one of which came out in 1937-38, devoted to the whole fascinating history of Prof. Hugo Junkers and his brilliant design team who contributed so much of benefit for international air transport in the 1921-38 period. To the best of my knowledge, no English editions of these German books have been published.

This is a pity because, although all Junkers transports have been meticulously described and fully recorded in "Jane's A.W.A." annuals (and indeed in back issues of THE AEROPLANE and THE AEROPLANE SPOTTER), a vital gap in the aircraft historian's bookshelf remains unfilled by the absence of an English edition of a book devoted entirely to Hugo Junkers' life story, including the long line of transport aeroplanes bearing his World-famous name.

I wonder how many aircraft historians in the U.K., in Europe and in Germany are aware that the original Junkers W-33L "Bremen" (serial D-1167) can still be seen today? It's one of several aircraft exhibited at the Ford Foundation Museum, in Dearborn, Michigan.

Nairobi, Kenya. DENNIS M. POWELL.

[The specification for the Junkers Ju 52 published in "Jane's All the World's Aircraft" for 1930 gives the engine as being one 720/800-h.p. water-cooled Junkers L.88. In "Jane's A.W.A." a picture appears of the machine on wheels with the double wooden airscrew referred to by various readers and is quoted as having one 720/800-h.p. Junkers L.88 engine. A picture also appears of a Ju 52 on twin floats with a radial air-cooled engine which is quoted as being an Armstrong Siddeley Leopard. Performance figures are quoted for both these engines and also for the BMW.VI 12-cylinder water-cooled engine.—ED.]

Groundabout

Board Floored. Government departments provide our commercial people with many a wry smile. The latest confusion comes from the Board of Trade who, when asked by an aircraft dealer for an import licence for a Beechcraft A.35 Bonanza, replied that they believed its performance was similar to that of the "Austin Autocar," and wouldn't the latter type suit the dealer's purpose? Well, either the Bonanza isn't what it was, or the Autocar is more than it was—or is there some vague confusion with the Austin A35 car? Only trying to help, you know.

*

Measuring Up. Air Cdre. Christopher Paul has quickly got into his stride as the Air League's secretary-general, which also includes the managing editorship of *Air Pictorial*. As well as activating the League's ideas for better British aviation, he's organizing their sociable caravan at Lasham's National Gliding Championships, which this year will be opened by the League's chairman, the Duke of Hamilton. There, too, Chris Paul, who is on the B.G.A. council, will manage the R.A.F. gliding team. On the powered side, he is soon taking delivery of one of Norman Jones's Turbulents which is such an individual job that the cockpit is practically made to measure. The Air Commodore has, in fact, already had two fittings.

*

On the Bomarc

A battle was lost for the want of a nail,
This is something we know,
Now we find an ARROW is lost,
All for the want of a "BO."

*

Many years ago, a production "expert" was looking around the Avro factory with a view to speeding things up. In a hangar a biplane had just been fitted with floats. In front of it a hangar worker was sprinkling water to lay the dust. The efficiency man turned to the works manager and said sharply "Come now, this is no place to test that seaplane!"

*

'Tis said that the pilots of a certain type of jet airliner are being issued with gloves so that they can't see the whites of their knuckles.

by Gremlin

NOTES AND EVENTS

AIR BP.—An exhibition showing various aspects of quality control and fuelling techniques, and a photographic display of AIR BP's international aviation activities, was held last month at Londonderry House, London, W.1, during a reception given by BP for the member airlines of the British Independent Air Transport Association.

INDUSTRIAL SERVICE.—Newton Victor, Ltd., the X-ray department of the Metropolitan-Vickers Electrical Co., Ltd., has recently introduced a new service to industry—specialized brazing. This service is being provided at the department's Finchley Works, where specialized brazing plant is used in the manufacture of X-ray tubes and valves. Inquiries should be made to the company at 132-135 Long Acre, London, W.C.2.

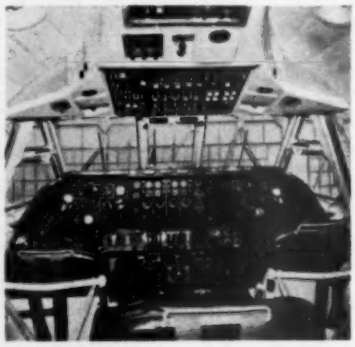
DC-6 SALE.—Travelair, Ltd., 115 Oxford Street, London, W.1, has been appointed exclusive agent for the sale of Cathay Pacific Airways' Douglas DC-6 aircraft.

WADE SALES.—An arrangement has been concluded between Davis and Timmins, Ltd., and Wade Couplings, Ltd., whereby Davis and Timmins have been appointed distributors and stockists of the Wade range of compression pipe couplings. Existing sales arrangements will not be disturbed and a considerable expansion is planned in the range of Wade products.

RADIO COMPASS.—The Marconi Type AD 722 sub-miniature automatic radio compass is being increasingly used in helicopters and has recently been installed in the Bristol 192, Westland S-55, Agusta Bell-47G and Sud-Aviation Alouette. The company has also received an order for AD 722s to be installed in two Westland Widgeons to be supplied to Bristow Helicopters, Ltd.

METAL TREATMENT. — Modern Electrolytic Patents and Processes, Ltd., and the European Metal Finishing Division of Roto-Finish, Ltd., are holding a joint exhibition of equipment and processes at the Birmingham Exchange and Engineering Centre finishing today, March 6. Demonstrations will be given of M.E.P.P. electropolishing on brass, nickel-silver and other copper alloys and of a range of entirely new metal-finishing processes now being introduced into the U.K. by Roto-Finish.

ELECTRONIC ACHIEVEMENT. — Ultra Electric, Ltd., of Western Avenue, London, W.3, has published a booklet describing the company's growth and development since its formation in 1920. The publication mentions a number of items produced for the aircraft industry.



HEATED GLASS.—A feature of the flight deck of the new Vickers Vanguard is the use of Triplex gold-film safety glass for all windows. The centre three glasses are de-icing windows and are also designed to be resistant to bird impact. The remaining 10 windows on the flight deck are de-misting windows.

Aviation Calendar

March 7.—British Interplanetary Society lecture, "Radio Communication with a Space Probe," by Dr. W. T. Blackband (R.A.E.), at Caxton Hall, Caxton Street, **London,** S.W.1, at 18.00 hrs.

March 9.—R.Ae.S. Halton Branch lecture, "The Trans-Antarctic Expedition," by Sqn. Ldr. J. H. Lewis, at Branch H.Q., R.A.F. **Halton,** at 18.45 hrs.

March 10.—R.Ae.S. lecture, "Water and Ice in the Atmosphere," by R. F. Jones, in the library, 4 Hamilton Place, **London,** W.1, at 19.00 hrs.

March 10.—R.Ae.S. Boscombe Down Branch, film show, in the lecture hall, A. and A.E.E., **Boscombe Down,** at 17.45 hrs.

March 11.—R.Ae.S. Bristol Branch, Barnwell Memorial Lecture, "Bristol Prototypes," C. F. Uwins (Bristol), at the Faculty of Engineering, **Bristol University,** at 19.00 hrs.

March 11.—R.Ae.S. Chester Branch lecture, "Bird Flight," by Capt. J. Laurence Pritchard, at the Grosvenor Museum, **Chester,** at 19.30 hrs.

March 11.—R.Ae.S. Manchester Branch, Chadwick Memorial Lecture, "Factors in Air Transport Economics," by N. E. Rowe (Blackburn), at the College of Technology, **Manchester,** at 19.30 hrs.

March 11.—R.Ae.S. Hatfield Branch lecture, "Metallic Materials for Supersonic Aircraft," by Mr. Meikle (R.A.E.), at the de Havilland restaurant, **Hatfield,** at 18.15 hrs.

March 11.—R.Ae.S. Southampton Branch lecture, "Aviation Medicine," by Sqn. Ldr. D. R. H. Urquhart (Inst. of Av. Medicine), in the Inst. of Education, University of **Southampton,** at 20.00 hrs.

March 11.—R.Ae.S. Weybridge Branch lecture, "The Air Registration Board," by R. E. Hardingham (A.R.B.), at the Apprentice Training School, Vickers-Armstrongs (Aircraft), Ltd., **Weybridge,** at 18.10 hrs.

March 11.—Kronfeld Club talk, "Navigation," by L. Welch, at 74 Eccleston Square, **London,** S.W.1.

March 12.—R.Ae.S. 12th Louis Blériot Lecture, "The Griffon and the Prospect of Combining the Turbo-Ram-Jet Engine for Propulsion of Aeroplanes at High Speeds," by M. l'Ing.-Gen. de l'Air Noël Daum, at the Inst. of Mech. Engineers, Birdcage Walk, **London,** S.W.1, at 18.00 hrs.

March 12.—Institute of Transport, South Western Section lecture, "Management of Air Services," by G. W. Pitt (Eagle Airways), at the Great Western Hotel, **Exeter,** at 12.30 hrs.

March 13.—British Gliding Association Ball, 19 Park Lane, **London,** W.1, at 20.30 hrs.

March 18.—Aircraft Recognition Society, film show, in the R.Ae.S. library, 4 Hamilton Place, **London,** W.1, at 19.00 hrs.

March 19.—R.Ae.S. Guided Flight Section lecture, "Long-range Missiles," by E. C. Cornford, at the Inst. of Civil Engineers, Great George Street, **London,** S.W.1, at 18.00 hrs.

ELECTRICAL CONNECTORS.—The Aircraft Components and Connector Division of Thorn Electrical Industries, Ltd., has introduced a new series of sliding rack connectors for use with racked components in console equipment. Full details of the complete series can be obtained from the company at Great Cambridge Rd., Enfield, Middx.

Company Notices

Maitland Air Charters, Ltd. (619,914)—Private co. Reg. Jan. 29. Cap. £2,000 in £1 shs. Objects: To carry on the business of air transport contractors, etc. Directors: John R. Maitland, The Weald Cottage, Limpsfield, Surrey; Malcolm Macdonald, 214 Wickham Way, Shirley, Surrey. Sec.: Malcolm Macdonald. Reg. Off.: 19 Hanover Square, London, W.1.

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New Patents

APPLICATIONS ACCEPTED

811,552.—General Motors Corporation.—"Turbojet engine thrust reverser apparatus."—May 31, 1957 (June 14, 1956).

Application open to public inspection on April 8, 1959; opposition period expires on July 8, 1959.

811,840.—Minister of Supply.—"Aircraft."—Sept. 8, 1955 (Sept. 14, 1954).

Application open to public inspection on April 15, 1959; opposition period expires on July 15, 1959.

RECEIVERSHIPS (Appointment or Release)

Surbiton Aircraft Products, Ltd. (356,335). Kings Road Works, New Haw, Weybridge, Surrey. Daniel Mahony, 3 Great Winchester St., London, E.C.2, ceased to act as Receiver and/or Manager on December 5, 1958.

Birth Notices

Brunt.—On Feb. 22 to Pat, wife of Flt. Lt. R. H. Brunt—a son.

Clay.—On Feb. 20, at the Whittington Hospital, Highgate, to Jean (*née* Folkard), wife of Flt. Lt. C. E. Clay—a son.

Crawford.—On Feb. 14, at Western General Hospital, Edinburgh, to Flt. Lt. and Mrs. Ronald M. Crawford—a son.

Franklin.—On Feb. 18, at Ronkswood Hospital, Worcester, to Elizabeth (*née* Carrey), wife of Flt. Lt. David Franklin—a daughter.

Giles.—On Feb. 13, at R.A.F. Hospital, Wegberg, B.F.P.O.43, to Peggy (*née* Ford), wife of Sqn. Ldr. D. Giles—a daughter.

Hawkins.—On Feb. 10, at R.A.F. Hospital, Akrotiri, Cyprus, to Lucille, wife of Flt. Lt. M. F. Hawkins—a daughter.

Riseley-Prichard.—On Feb. 14, to Alannah (*née* Busk), wife of Sqn. Ldr. R. A. Riseley-Prichard—a daughter.

Straker.—On Feb. 21, at Aldershot, to Lilian, wife of Wg. Cdr. W. J. P. Straker—a daughter.

Utton.—On Feb. 11, to Fern, wife of Flt. Lt. K. Utton—a son.

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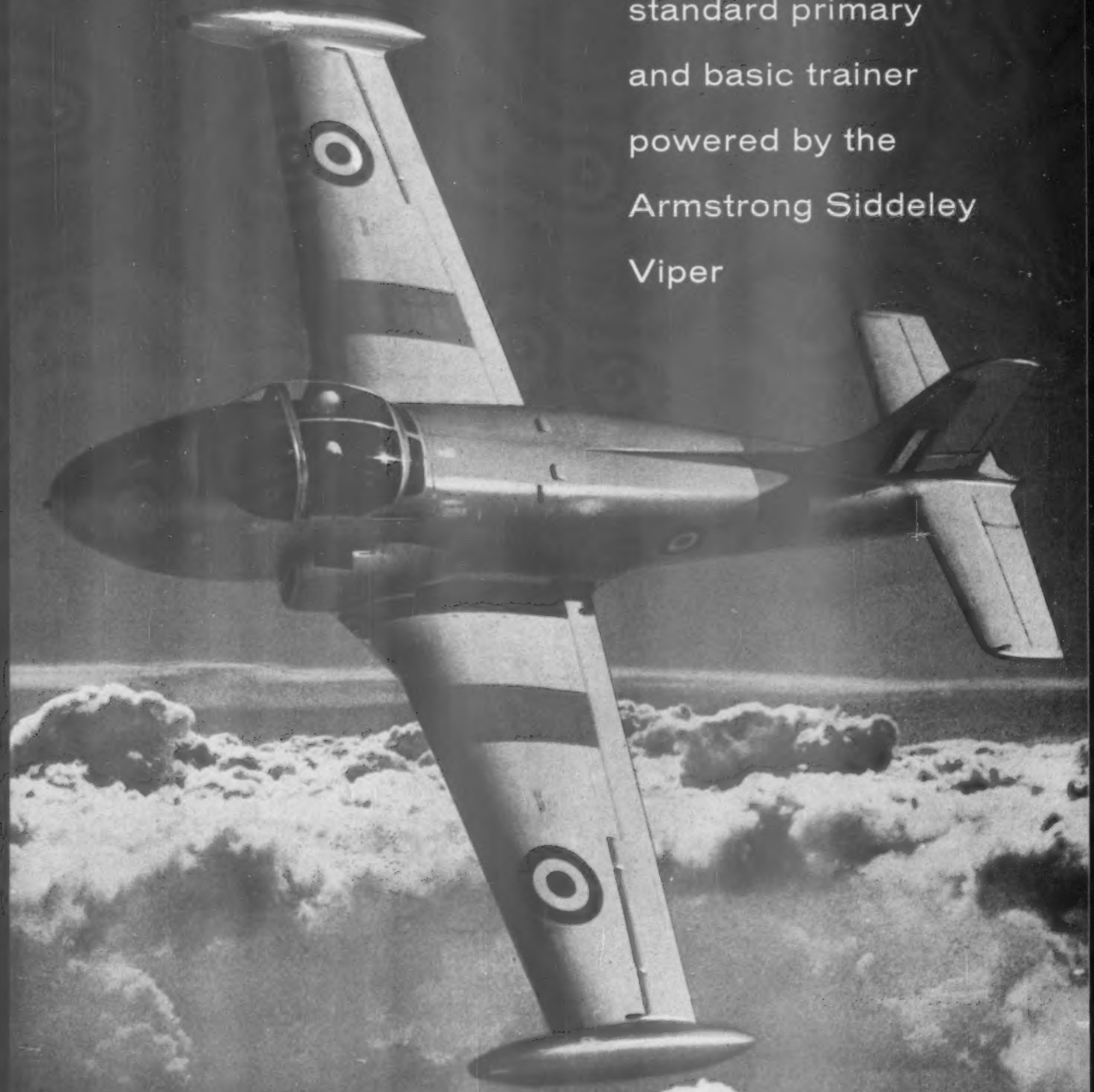

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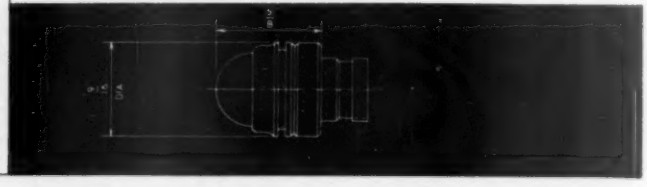

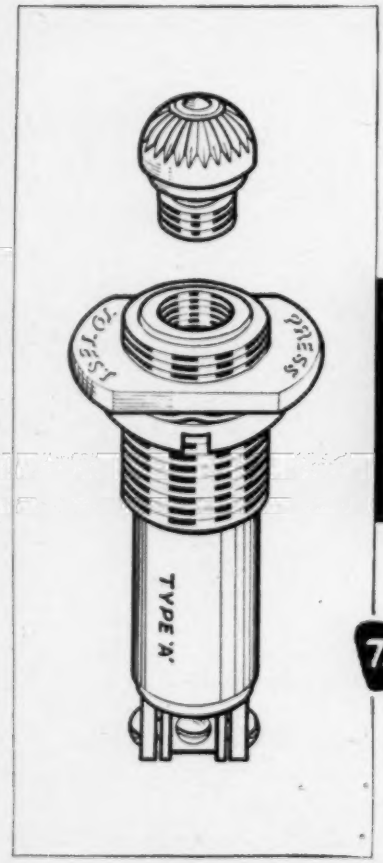

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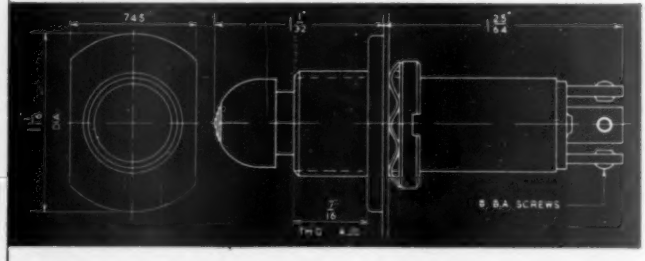

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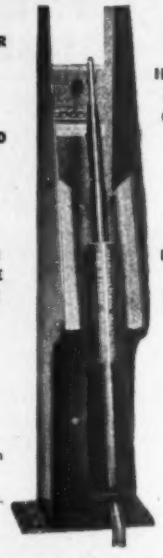

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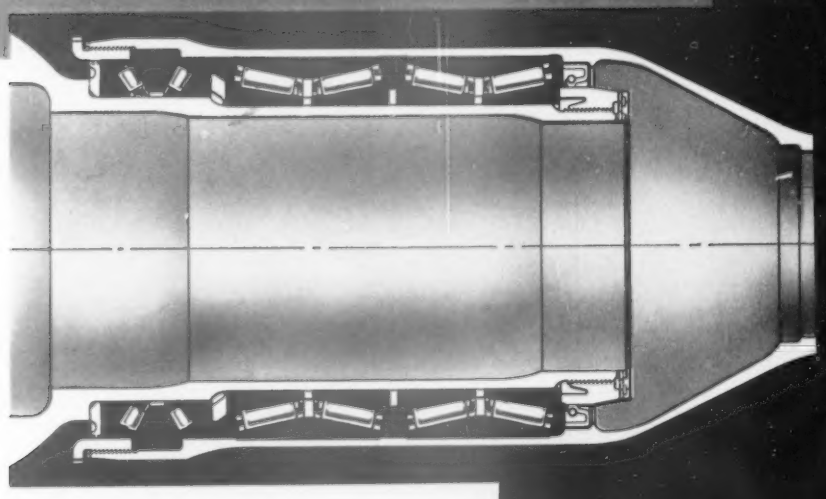

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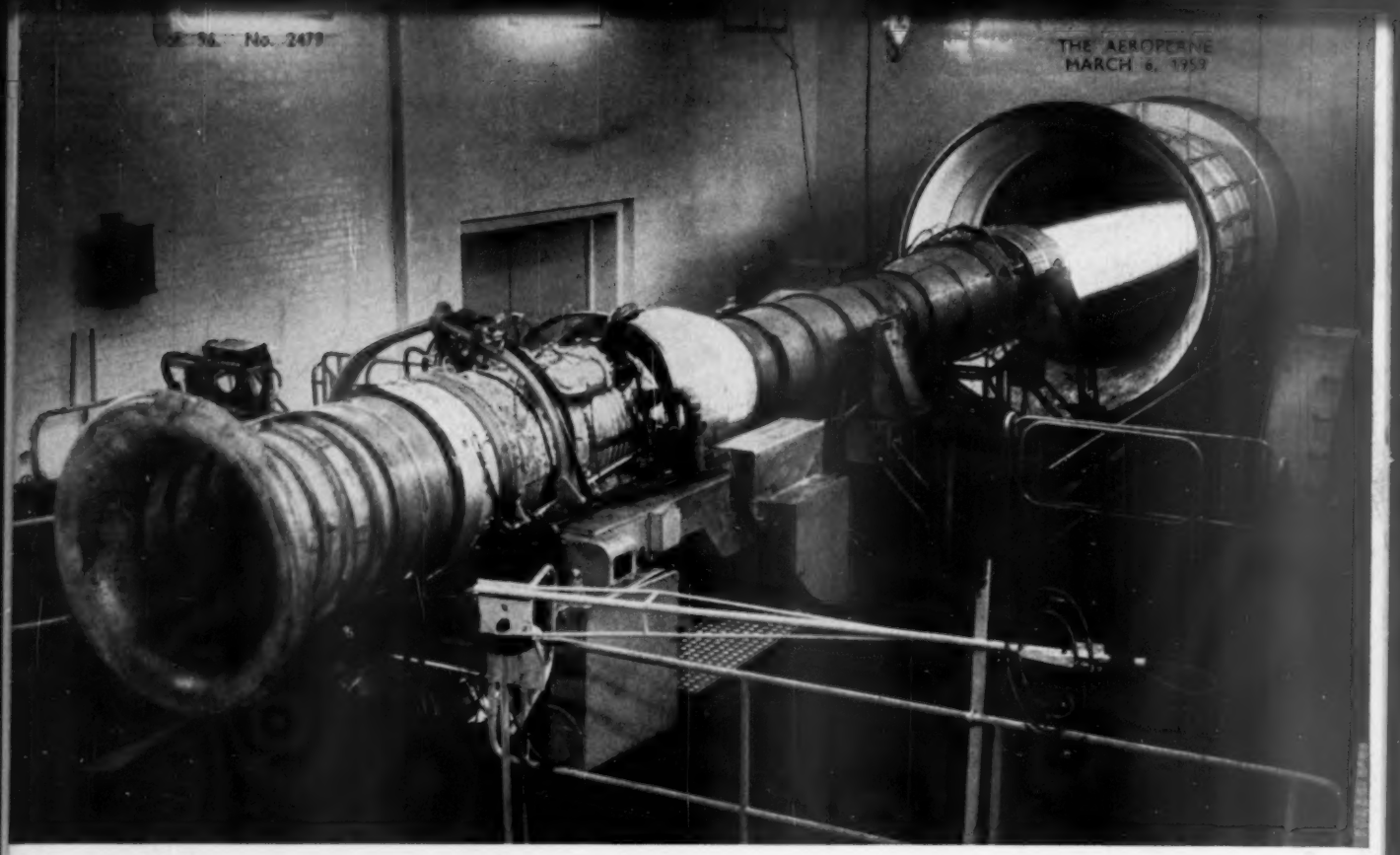

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